



1959 ANNUAL REPORT

SECRETARY OF THE
INTERIOR

FRED A. SEATON



FOR THE FISCAL YEAR ENDED JUNE 30, 1959

*Resources for a
Growing Population*

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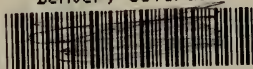
SECRETARY OF THE INTERIOR

FOR THE FISCAL YEAR ENDED JUNE 30, 1959



Resources for a Growing Population

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THE SECRETARY OF THE INTERIOR
WASHINGTON

DEAR MR. PRESIDENT: It is a pleasure to transmit to you the annual report of the Department of the Interior for the fiscal year 1959.

This summary of departmental activities has been prepared in the hope that it will serve the cause of sound conservation and development of our natural resources by increasing public knowledge and understanding of this important area of the Nation's responsibilities. Particular emphasis is given in part I of this year's report to the challenge presented in assuring an adequate resource base for our growing population.

Sincerely,

Wesley A. Sealou

Secretary of the Interior.

THE PRESIDENT
THE WHITE HOUSE

United States Department of the Interior



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PART I

RESOURCES FOR A
GROWING POPULATION

Resources for a Growing Population



EARLY AMERICA was a land of seemingly limitless plenty. Its great plains were richly productive, its rivers and streams teemed with fish, its forests were timber-laden, its mountain ranges held vast mineral treasures. If, at times, our fathers and forefathers were wasteful of these precious natural resources, there were always more trees to be cut, more land to be tilled, more deer and quail at hand for the hunter, more fuel near at hand for the taking.

But as the passage of time brought great population increases—together with an ever higher standard of living—it became evident that we could not continue indefinitely to deplete the Nation's natural resources without in time facing serious consequences.

Consequently, the wise concept of use without abuse came into being through the inspired leadership and vision of men such as Theodore Roosevelt and Gifford Pinchot, our pioneer conservationists. This concept—coupled with a sober sense of responsibility toward future generations—has saved many of America's priceless resources from destruction.

Public Attitudes Still Vary

Today, with population gains reaching ever more dramatic proportions, public attitudes still vary between the extremes of those who complacently believe that our resources are inexhaustible—and those who feel that American living standards, caught in the crush between expanding population and a fixed resource base, must inevitably decline.

Actually, neither the view that our land, water, mineral, timber, wildlife, and recreational resources are without end, nor the pessi-

mistic prediction of eventual resource poverty, is sound. The first ignores the dangers inherent in unrestricted and unplanned use of resources, while the latter fails to consider the dynamic influences of science, technology, and human enterprise.

Looking Ahead

The Department of the Interior, as the Federal Government's principal agency in the field of natural resources, is fully aware of the impact of population pressures on America's natural resource base. But it is the Department's conviction that sound conservation, wise use, and orderly development of our resources will insure a steadily higher standard of living not only for today's citizens but for the multiplying millions of future Americans.

Nevertheless, the achievement of this objective will require the best thinking and planning of the Nation as a whole in the decades ahead. In this process, the Department will play a vital role. It faces today, and expects to continue to face, many difficult problems in carrying out its responsibilities to provide for the wise use of the priceless heritage represented by our abundant natural resources.

How Many Americans?

During the first half of this century, population in the United States doubled—from about 75 million in 1900 to over 150 million by 1950.

Estimates for the future take into account a continuation of the high rate of annual increase which has characterized the years since World War II. Since 1946, we have seen the population expand by some 38,000,000 Americans—more than the entire population of the Nation in the 1860's.

At the present time, our population is being increased by 1 person every 11 seconds, 330 every hour, 8,000 every day, a quarter of a million every month. Our number is now approaching 180 million. By 1980, just 21 years away, there will be nearly 275 million Americans. By the year 2000—which is only 40 years away, despite the remoteness of its sound—our present population may well double, reaching a total of 350 million persons.

Examined within the framework of these figures, the task of building from a fixed resource base to provide a peaceful, abundant life for the America of tomorrow can indeed be seen to be a staggering one.

Four Broad Fields of Endeavor

In undertaking to protect and develop our natural resources to meet the requirements of a growing population, the Department will direct its efforts increasingly in the years ahead into these four broad fields:

Research which will result in a fuller knowledge of the extent, character, and utilization of basic natural resources.

Management of renewable resources to insure full, efficient use on a sustained yield basis.

Prevention of waste in the development and use of mineral and water resources through new techniques and new programs to insure full utilization.

Preservation and enhancement of scenic, wildlife, and recreational resources which, once destroyed, can never be replaced.

On the following pages are outlined some of the problems which a growing America must face in the conservation and use of its natural resources—and the basic programs which the men and women of the Department of the Interior believe will result in finding ways to meet and solve the problems.

Water Resources

The availability of water—just plain, ordinary water—is rapidly becoming a major concern to America and to the world. In fact, as early as 1975–80, it may well be our number one domestic resource problem.

American industries, farms, and homes are today calling for an ever-rising tide of water. Presently, the Nation uses about 240 billion gallons of water daily. In 20 years, our growing population may require in excess of 600 billion gallons per day—if we have it available.

This prospect need not be one to cause alarm, but it is a matter of serious concern to the United States—one which leaves no other choice than to continue our current water conservation progress and to plan wisely and imaginatively for the years ahead.

In essence, the water problem is this: First, how do we supply a growing population and a dynamic economy with increasing amounts of water at a reasonable cost? Second, how do we, also at a reasonable cost, make certain our flowing waters are an asset to our people and not a hazard?

Only the eastern one-third of the United States has an annual average precipitation in excess of 30 inches. Here, our growing population will find an ample supply of water for present and foreseeable needs at a reasonable cost.

In the remaining two-thirds of the Nation, annual precipitation varies from a high of 30 inches to desert areas with less than 10. In these areas, water costs are moving upward in proportion to a corresponding use of available supplies. In the more arid areas, which include heavily populated regions, permanent water supplies in large quantities must be transported vast distances.

The water problem is not merely one of availability but also one of quality. A considerable portion of the ground water in the southeastern coastal plain and in some Midwestern States is brackish. Some streams are extremely salty, others are turbid and muddy, many more reek with man-made pollution. For any one or a combination of these reasons, communities face water problems even in areas where precipitation is ample.

In the western United States, the principal problem is quantity—and this problem is immediate, not long range. The quantity problem is further complicated by uneven seasonal streamflow, the need for regulation, limited knowledge of underground flow, and evaporation losses.

In the East, the water problem is primarily the treatment of surface water to make it usable, as well as more effective management of ground-water reservoirs.

Many areas will continue to get all the water they require from conventional sources. Water flows in wasteful abundance into the oceans from streams throughout the United States. After a century of water conservation, only about one-third of the water that courses to the sea is used in our 17 western States, and only about one-eighth of the supply in the East is put to human use.

Progress is being made gradually but steadily in capturing and using a larger percentage of this flow, but in many areas a more unorthodox, almost visionary, approach is needed to meet current and future water needs created by population pressures.

Desalting the Oceans

One day—sooner than many people realize—the United States will have to follow a new trail for its water supply, at least in certain areas. This trail leads to the inexhaustible oceans and seas of the world and to huge, known supplies of brackish water within the continental United States.

Getting the salt out of sea water is nothing new. Sailors have been doing it for centuries. Today, the crews of atomic submarines, such as the *Nautilus* and *Skate*, drink water converted by heat from their atomic reactors.

In fact, for a long time people have known how to get fresh water from the sea—by simply distilling it. Today, the Department of the Interior, through its Office of Saline Water, seeks the answer to the following question:

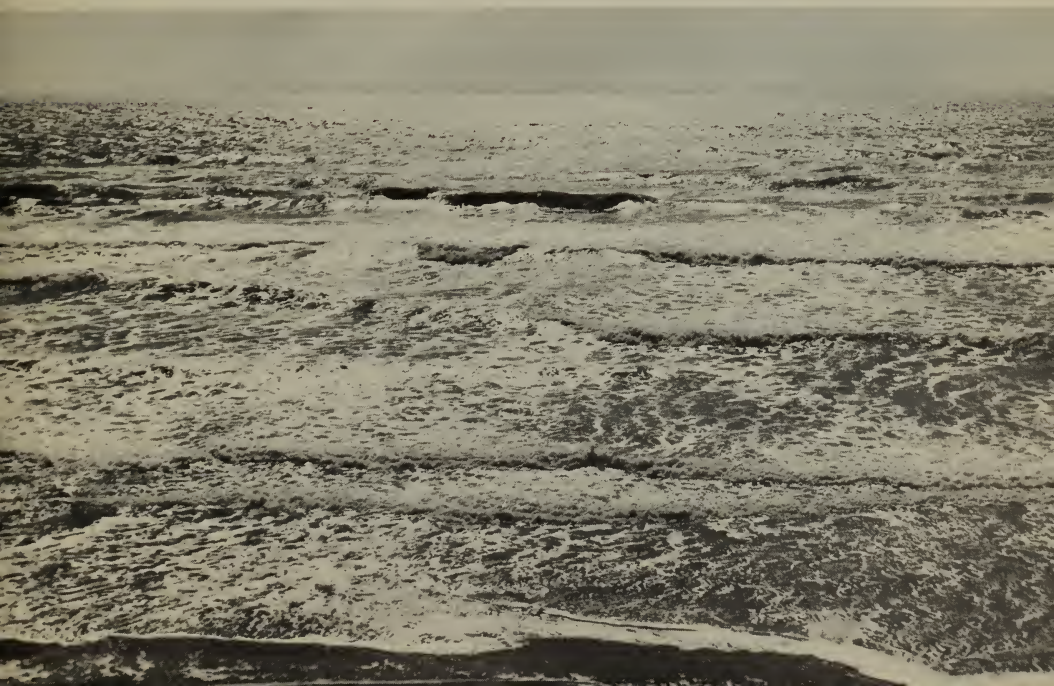
How can saline water be converted to fresh on a large scale at a cost cheap enough to substitute for water from conventional sources?

Water from the Sea—A Reality

Presently operated salt water conversion plants do the job with technical efficiency, but the cost is high. Sheer necessity, not competitive advantage, has caused them to be built in recent years.

On the arid island of Aruba in the Caribbean, for example, people are drinking, and oil companies are using, about 3.5 million gallons of converted sea water daily. The cost is about \$1.75 per

The oceans and seas of the world can provide an endless supply of water for increasing home and industrial use—and eventually irrigation use. The Department's saline water conversion program offers hope to solve one of man's oldest problems.



thousand gallons compared with the minimum rate of 26 cents per thousand gallons in the Capital of the United States.

In the Virgin Islands, converted saline water will be used upon completion of a conversion plant. The population there has outstripped existing supplies, and water is currently hauled by barge from Puerto Rico at a cost of nearly \$4 per thousand gallons.

Coalinga, a small community in California, hauled its drinking water for years at a cost of \$7 per thousand gallons. Making history, the town is the first in the United States to get its water supply from converted brackish water—at a cost of \$1.45 per thousand gallons.

Beating the Cost Problem

In many areas of America, particularly in the West, new supplies of fresh water from natural sources will surely become more expensive and the amounts available will not meet requirements. In many communities, cost curves will one day cross, and converted sea water will be the less expensive.

Of course, for some towns there is only one curve, one price, and one choice: pay the bill, suffer economic stagnation, or move out. Their water supplies are running out and no more are in sight.

The goal of the Department is to help forestall any possible water-caused local economic disasters by developing processes to make large quantities of converted water available on an economic basis. In this work, the Department enjoys the growing cooperation of private industry, research organizations, colleges and universities, and the scientists of more than 16 nations of the world.

Saline Water Program

In 1952—just a little more than 7 years ago—the saline water conversion program was authorized by Congress. In that short span of time, the curve of comparative cost has gone down further and faster than in all previous human history.

As recently as the late 1930's, it cost between \$4 and \$5 to convert a thousand gallons of sea water into fresh. Meanwhile, equipment, fuel, and labor costs have increased several fold. In spite of this, saline water conversion costs have been cut by more than half. In the most effective plants in existence, it is now about \$1.75 per thousand gallons.

The Department's program began with laboratory research. Next, it included small pilot plants, and now it is about to move on to

construction of large demonstration plants. In 1959, the program waited in the wings of a new and larger stage; where, for the first time, prospects are hopeful for breaking the dollar-per-thousand-gallons barrier.

Legislative Milestone

During fiscal 1959, President Eisenhower signed Public Law 85-883. The bill as finally enacted had the support of the Department of the Interior. This new law authorized the Department of the Interior to construct and operate five saline water conversion demonstration plants.

Three will be designed to produce fresh water from the sea. One of these plants is to be located on the East coast, one on the West and one on the Gulf coast. Two of this group of three will be capable of producing at least a million gallons per day.

In addition, two plants will be constructed for the treatment of inland brackish water—one in the Southwest, the other in the Northern Great Plains. One of these plants will have a capacity of at least 250,000 gallons per day.

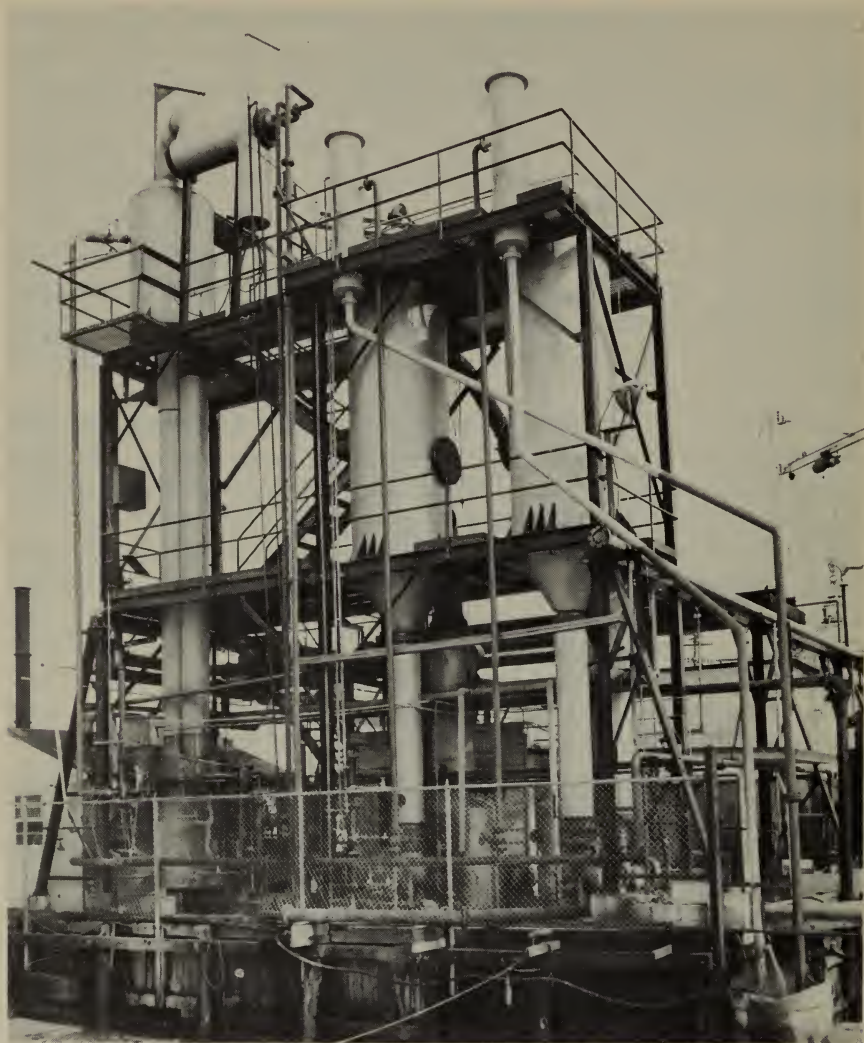
Current Progress

The first demonstration plant will use the long-tube vertical multiple-effect distillation process, developed jointly by the Department of the Interior and the late W. L. Badger of Ann Arbor, Mich. It will be constructed on the Gulf Coast at Freeport, Tex. During the past year, the Department requested funds from Congress to speed its construction.

The Department believes that potable water can be produced in this plant for less than \$1 per thousand gallons. As the size of the plant increases, it is expected that, where 15-20 million gallons per day are processed, the cost may be less than 60 cents.

The second plant will be located near San Diego, Calif., utilizing the multistage flash distillation process. For this plant, the Department is requesting the Atomic Energy Commission to supply a low-temperature, low-pressure atomic reactor as the heat source. The flash process lends itself to large-scale conversion and, with atomic heat, may open a new field for the peaceful application of the atom.

The third process, electrodialysis, will be demonstrated in a plant located either in the Northern Great Plains or the arid Southwest. Work on this and the remaining processes and plants are being pushed forward by engineers and scientists of the Department.



The long-tube vertical multiple type effect distillation process, developed in this experimental facility, was selected by the Department for the Nation's first full-scale effort to convert sea water to fresh water for municipal and industrial use.

The Years Ahead

Looking to the future, the Department of the Interior holds great hope that a key fact in human history is about to change: The fact that up to now the people of the world have depended for life entirely on fresh water upon and beneath the land.

Bearing in mind that an acre-foot of water is 325,851 gallons, the world is a long way from the day when converted sea water can be used for irrigation. That is not to say it can never be done. Once the world can not only tap the oceans for fresh water for human and industrial use—as we now can—but also for agriculture, wastelands can become gardens.

From where we stand now, we can with justification gaze toward a new horizon where arid sections of America, Mexico, the famine-cursed drought quadrangle of Northeastern Brazil, the vast unpopulated expanses of Africa, Saudi Arabia, West Pakistan, the Negev area of Israel, and Australia, to name a few, will flourish—some for the first time in all recorded history.

Bringing blessings to expanding populations in America and to millions of people around the globe, the arrival of one or more genuinely low-cost processes can well become one of the most important scientific achievements of our time.

Reclamation Progress

Despite the remarkable progress in conversion of saline water to fresh water over the past few years, the reclamation program of the Department of the Interior continues to be a vital, life-giving source of water for our 17 Western States—as it has for over 50 years.

Nor will a successful saline water program place in obsolence the activities of the Department's Bureau of Reclamation. The bulk of the Department's water conservation program will be administered by the Bureau of Reclamation whose multipurpose projects have been conservation landmarks.

In the West, the Bureau of Reclamation has been engaged in water resource development since 1902, and the Bureau has played and will continue to play an indispensable role in the conservation programs of the Department.

In 1860, the West contained only 4 percent of the National population. By 1900, the population of the 17 Western States had increased to 11,187,961, or 14.7 percent of the National population. By 1958, the West had increased to a population of 42 million, or roughly 25 percent of our National population.

However, the fact that the area has been able to develop sufficient water to permit this rapid growth is no cause for complacency for the future. In fact, Western municipal and State officials are greatly concerned about future water needs, because they are well aware that the closest and cheapest sources of water already have

been utilized. Virtually every major water project now being considered in the West is complex and costly in comparison.

This steadily increasing demand for water underscores the importance of engineering and economic investigations which are an important phase of Bureau of Reclamation operations.

Reclamation Investigations

Engineering and economic investigations determine the necessity for and feasibility of proposed projects. They contribute to a shelf of planned projects which may be undertaken as authorized by the Congress. All large water resource projects have a rather extensive "lead time" during investigation and legislative consideration. This is a factor that must be considered in any plans for expediting water resource development to meet the demand of future generations.

Multipurpose dams of the Department are designed to meet the current and future needs of our population through water storage, power generation, flood control, fish and wildlife preservation, and recreational facilities.



The Central Valley project, for example, was conceived by the State of California more than 30 years ago. The Federal Government undertook construction of the project in the thirties and the big Shasta Dam was built just before World War II. Construction was resumed after World War II ended and the \$800 million project is now more than two-thirds completed. The great Central Valley project will help control flood-rampaging rivers, store water and transport it in river-sized canals for use by municipalities, industry, and agriculture in a 500-mile-long valley. Project power-plants will generate nearly 1 million kilowatts of hydroelectric power, and its reservoirs and canals will yield other major public benefits in fish and wildlife propagation and new recreational facilities.

The Pick-Sloan plan for flood control and water development on the Missouri River likewise was conceived in the thirties, and initial features were authorized in the Flood Control Act of 1944. Fifteen years later, \$478.6 million had been expended toward construction of the reclamation features for this 10-State development, and additional millions had been invested in flood control-navigation structures built by the Corps of Engineers, U.S. Army, on the main stem of the river. As of June 30, completed Bureau of Reclamation facilities of the Missouri River Basin project will provide full irrigation to 152,000 acres, supplemental irrigation to 50,000 acres, a power generating capacity of 126,200 kilowatts, and partial flood control on several main tributaries of the Missouri River.

Similarly, the Colorado River Storage project, authorized in 1956, was under investigation for a quarter century, and will require between 30 and 50 years to complete the ultimate project. This great comprehensive project will store and transport water for consumptive use in a four-State, semiarid area larger than New England, and its multiple man-made "lakes" will contribute major fish and wildlife and recreation benefits. Water released from storage reservoirs will generate needed power for the area in hydroelectric power-plants with a total capacity in excess of 1 million kilowatts.

About one-tenth of the Bureau's personnel are engaged in project and drainage basin investigations and advance planning. Included along with the more than 100 proposed projects under active study are comprehensive investigations into the optimum development of land and water resources in 11 river drainage basins. Statewide water resource development studies in Texas and Alaska also are being conducted by the Bureau of Reclamation, in cooperation with other Federal agencies.

In the decades ahead, these and other multi-purpose water resource projects will help to provide essential water in areas of

mounting population in our 19 Western States, including Alaska and Hawaii.

Current Work

In the arid Western area served by the Bureau of Reclamation, some 73 projects and units are currently under construction. On many of these projects, construction is virtually completed or is far enough along so that the water development program is essentially complete or partially in operation. When completed, the projects now under construction will provide facilities to bring irrigation water to an additional 1,717,000 acres of land, bringing the total area which can be served from Bureau of Reclamation facilities to 9,906,000 acres. Construction is under way on 12 powerplants that will have an ultimate installed capacity of 1,225,150 kilowatts, increasing the total in plants built by the Bureau of Reclamation to 6,346,150 kilowatts.

Water for Cities and Industry

Since the early days of reclamation, the important multipurpose aspects of providing water for municipal and industrial purposes have been recognized by the Congress culminating most recently when President Eisenhower signed the Water Supply Act of 1958, Public Law 85-500.

This act provides authority for the Corps of Engineers and the Bureau of Reclamation to make provision for storage not only for immediate but also for future water supply needs in connection with Federal multipurpose projects, thereby permitting the Federal Government and local interests to share equitably in the benefits of multipurpose construction.

The principle is established that storage for future use may be included in any reservoir project, planned or to be planned, constructed or to be constructed. The act is intended to provide the additional means whereby anticipated future municipal and industrial water supplies may be developed to ensure the most effective and economical use of water resources for current and future generations.

Water for Agriculture

Throughout the 57-year history of the Department's reclamation program, water has been put to work to meet the growing food demands of an expanding population.



Through the Department's reclamation program, storage of spring water runoff in the rocky desolate areas of the West provides irrigation water miles away for the cultivation of nonsurplus foods to feed our expanding population.





Byproduct electric power of the reclamation program sings through transmission lines toward growing cities for home and industrial use.

Since 1906, cumulative crop value has exceeded \$14 billion, nearly three times the total of the Nation's entire reclamation investment. In 1958, the latest year of record, the value of crops harvested on reclamation lands totaled \$987 million, some \$36 million higher than the 1956 record crop year.

While reclamation facilities have been doubled since 1940, total crop value during the same period multiplied nearly ninefold. The vast bulk of irrigation-based agriculture has, over the past few years, been concentrated in specialty crops of high commercial value—unsubsidized by the Federal Government.

In the years ahead, growing demand for agricultural products such as fruits, table vegetables, and nuts will be met increasingly from farms which owe their existence to an adequate, dependable water supply provided by reclamation facilities of the Department of the Interior.

Water Promotes Progress

The contribution of irrigation to the growth of local areas can be seen in an economic study completed by the Bureau of Reclamation in fiscal 1959 showing how reclamation promoted the growth of farm-associated industries in the Columbia Basin Reclamation project in central Washington.

The study, entitled "Growth of Agricultural Processing and Marketing Facilities," points up the following economic benefits in the first few years of an irrigation project where a single crop economy was supplanted by diversified agriculture of high-demand, high-value crops.

The marketing and processing of 50 different crops, worth \$24 million in 1957, has resulted in widespread local business expansion. Sixty-four new plants costing \$17 million have been constructed. Plant payrolls in spite of automation in modern processing increased the equivalent of 750 man-years and \$3.1 million in wages. Rail shipments to and from the project increased 40 percent, and truck shipments increased 275 percent between 1952 and 1957. In 1949, fully 99 percent of the crop shipments from the project area consisted of small grains, most of which were in surplus. By 1954, 44 percent of the crop shipments were nongrain products. Livestock feeding and slaughtering and dairying also showed a marked increase.

Economic studies also were published on the accomplishments of reclamation on the Kittitas Division of the Yakima project in Washington State, and of the Lower Yellowstone project in Montana and North Dakota. The Kittitas study disclosed that this project had produced in additional Federal tax revenues since 1940 a total of \$11,400,000—a sum greater than the cost of construction. In addition, area farm production was increased 84 percent, or \$5 million annually; retail trade increased 57 percent, and farm value increased an average of \$13,000 per farm unit.

On the Lower Yellowstone project, Federal tax revenues since 1940 are nearly double the cost of the \$4 million project, which is now 65 percent paid for by its local beneficiaries. Retail sales in the project area are four times as great as in the nonirrigated area, and project irrigated land outproduces adjacent nonirrigated land by about six times. Barley and oats are the principal crop on the dryland area, while the irrigated farms produce a large acreage of sugar beets and other crops which contribute to a thriving livestock feeding operation. Personal income in the project area is about three times greater than in the surrounding nonirrigated area, principally as a result of the irrigation of roughly 4 percent of the land area.

Reduction of Water Losses

An estimated 11.5 million acre-feet of water—more than is stored behind Grand Coulee Dam—is lost each year through evaporation from the lakes and streams of the West. Department scientists in cooperation with other Federal, State, and local agencies, are seeking new methods of making water resources fully useful.

The first large-scale research into the use of monomolecular “chemical shield” to reduce evaporation on large reservoirs was conducted during the year by the Bureau of Reclamation, in cooperation with other Federal, State, and local agencies. The tests, conducted at Lake Hefner near Oklahoma City, indicated that savings of 9 percent in water losses from evaporation were achieved under difficult conditions during tests extending over a period of nearly 3 months. Cost of the water saved was approximately equal in value to untreated municipal water to Oklahoma City. Additional research and field tests may lead to improved procedures and lower unit costs.

Progress also was made during the year in research into the control of water-stealing phreatophytes. These economically useless weeds, shrubs, and trees waste over 25,000,000 acre-feet of water each year, enough to more than fill Hoover Dam’s Lake Mead or several lesser reservoirs. For example, considerable remedial work has been done in the middle Rio Grande, where a saving of more than 300,000 acre-feet of water was accomplished between 1951 and 1958. This cooperative Federal-State project to remove water-wasting salt cedars will continue, and when completed, is expected to save over 100,000 acre-feet of water annually. This is but one example of how millions of dollars are being saved and will be saved throughout the West through various methods of water conservation developed by the Department.

Water for the Future

In many ways—from desalting of ocean waters to weed eradication programs—the Department of the Interior is working constructively to meet the water needs of future generations of Americans.

Water is the most familiar and the most important of our natural resources. No individual can live without water, no nation can outlast its available supply, and no civilization can grow beyond its capacity to store and utilize water.

Growth—both in terms of population and prosperity—is certain in the United States. Whether such growth is sustained and whether

the American of the future lives a full, abundant life, depends to a great degree upon our wisdom, foresight, and efforts today to provide adequate water in the years to come.

Land Resources

At the time of the first census in 1790, the total population of the United States was 3,929,214. Today, the population of the United States is nearing 180 million and is increasing at the net rate of 1 person every 11 seconds.

Since 1790 the land area of the United States has grown by about four times. Population has increased by approximately 45 times. In the years ahead, population growth may raise the United States census count to more than 250 million by 1980 and to 350 million by the year 2000.

Since the first land patent was issued by the Federal Government in 1788, the public domain has been a source of lands and resources for our growing population and productive economy. Today, the Department's Bureau of Land Management is working to assure the Nation of a continuing contribution to national growth from the public lands.

Of the original public domain, covering about 1.8 billion acres, over 1 billion acres have now been transferred to private and local government ownership. Of the remainder, the Bureau of Land Management is responsible for administration of about 475 million acres, mostly unreserved and unappropriated.

Lands for Our Growing Population

More people require more land—America's expanding population needs land for homes, farms, and factories; land for towns, for cities, highways, and recreation.

In the West, where most of the public domain remains, land needs will probably reflect the fact that the Western United States is growing about three times as fast as the rest of the Nation. Over half of the population increase in the West since 1940 has been the result of people moving west, and an important portion of future land needs in the West will be met from the public domain.

The expanding dimensions of the Nation's urban areas, as the cities sprawl further and further into the rural hinterland, are putting new demands upon public lands in many areas of the West. In California, in Nevada, in Arizona, and New Mexico, cities are reaching out to embrace public lands formerly valuable only for grazing and stockraising.

Another urgent need is land for recreational development. In carrying out its land program the Department is cognizant that special emphasis needs to be placed on the satisfaction of local, State and National recreational land needs.

New Land Concept

New legislation to permit planned urban and suburban development has been requested. The proposed law would make possible the application of the first new concept in public land disposition since passage of the Small Tract Act in 1938, by authorizing the development of areas up to 1,280 acres by private companies and local government.

Also, total supply of public land for private and public use is, in effect, being enlarged. Old, obsolete, or inefficiently used land withdrawals and reservations are being reviewed. Some withdrawals are being reduced in size to reflect actual need for land. Other unnecessary withdrawals are being eliminated entirely.

Requirements for public lands for public purposes are being met by a wide variety of program elements. Land for wildlife conservation is receiving particular emphasis. New arrangements for balanced multiple use of public lands are broadening the base of land use.

As new demands are made on the public land base, it will be increasingly necessary for the Department to manage the public lands wisely and assure balanced, harmonious use and development in the light of the long-term needs of the American people.

Before Development—Surveys

In the past, long before people and progress came to an area, public land surveyors of the Department's Bureau of Land Management laid out the familiar checkerboard of sections and townships.

Now, however, present-day needs no longer allow the time necessary for full surveys before all settlement and development. The new State of Alaska is a good example.

When Alaska became a State in January 1959, it received a land grant from Congress totaling 103,350,000 acres. The exact lands which the new State will receive were not spelled out in Statehood legislation; rather, Alaska will have 25 years to select land in Alaska from the public domain. The exterior boundaries of all of these lands (in tracts usually at least 5,760 acres) must be surveyed, and the boundaries of land claims inside selected tracts also will have to be surveyed.



Most public lands suitable for homesteading have already been settled, except in Alaska, but the public domain still provides land for suburban use for 2- to 5-acre permanent or vacation homesites.

If all of the Alaskan grant lands were in a single, compact circle, the task of surveying the exterior boundary alone would be approximately equivalent to surveying a line from San Francisco—across California, Nevada, Utah, Colorado, and Nebraska—to the Mississippi River at Omaha.

Applying Modern Techniques

In making this and other surveys, the Bureau of Land Management is employing the latest survey techniques and equipment in its cadastral survey operations.

Electronic measuring devices are speeding the computation of distances. Expert photogrammatists are applying the skills of precise aerial photography and photointerpretation to modern public land surveys. Helicopters are being used to speed survey crews to and from remote, rugged work areas.

To speed the development of resources and to permit many types of exploratory operations, the Department has begun an extension of the rectangular survey system by protraction over the remaining unsurveyed areas. This means sketching out the form of the public land survey grid by drawing lines on paper instead of laying out the boundaries on the ground. Protracted surveys will serve as the temporary basis for oil and gas leasing and many other land management activities until the lands are later surveyed on the ground.

To meet the growing needs for home and recreation sites, particularly in California, large areas are being surveyed and subdivided into small tracts.

Forest Products for Our Growing Population

No resource can demonstrate more clearly the need for planning for tomorrow's people than our forests. With a growth and harvest cycle that may span two to four generations, forest conservation today will determine the volume of the forest crop for many years in the future.

Altogether, the Department's Bureau of Land Management administers some 161 million acres of forest land, including about 46 million acres of commercial forest lands.

Forest production and harvest from BLM lands is done under the scientific principle of continuous sustained yield by harvesting the annual replaceable forest growth without borrowing from growing stock needed for future generations.

BLM forestry programs have an important impact on many local areas. More than 10,000 man-years of local employment are provided by this program annually. The end-product value of the

Sustained yield timber management on public domain lands provides a constantly renewing supply of timber for our growing needs.





Multiple-use of our public lands, such as the O. & C. lands in Oregon shown above, provide mineral and forest resources, wildlife habitat, and recreational facilities to meet the requirements of an expanding population.

timber harvest amounts to tens of millions of dollars in contribution to the local and national economies.

The Department's forestry program on public lands must, of necessity, take into consideration all aspects of resource conservation—timber production under sound methods; protection from insects, disease and fire; watershed management; recreational use; wildlife enhancement; grazing; and mineral production.

Creating New Forest Resources

Idle and unproductive forest land must be put to use to help meet future timber needs. Today BLM is seeding and reforesting lands that were formerly unproductive at an annual rate nearly double the previous 20-year total.

The amount of timber taken from each acre is now about double that taken from a comparable area 20 years ago. Losses from fire, insects, diseases and delayed regeneration are now much below that of the past two decades.

The completion of forest resource inventories is raising the annual allowable cut. New access roads are opening up virgin areas to intensive forestry. Under competitive bid sales, the Department markets over a billion board feet of timber annually from BLM lands—enough lumber to build nearly 100,000 average homes every year.

Minerals for Our Growing Population

The continual development of the resources on our public lands will help provide the expanding population with minerals and fuels necessary for a vigorous, growing economy.

The public domain lands contain a substantial part of the Nation's raw energy materials—oil, gas, coal, and nuclear fuels. In order to meet the future demand for energy, the production of mineral fuels will have to be doubled by 1975 and possibly doubled again by the year 2000. Exploration and development on the public domain will help meet this staggering increase.

Uranium, the raw material of nuclear power, will in the future be put to large scale commercial and industrial use. Known uranium resources will probably more than meet the needs of the free world for the next few decades. Uranium exploration has so far been confined principally to surface exploration, and subsurface exploration may multiply known resources many times.

Under the Mineral Leasing Acts of 1920, the General Mining Laws of 1872, and the Outer Continental Shelf Lands Act of 1953, the Department of the Interior carries on mineral development and conservation programs. Revenues to the Federal Government from these operations have totaled hundreds of millions of dollars.

Range Lands

The long-term goal of the Department's Bureau of Land Management range resource program is to rebuild the public domain range land to its full productive capacity. Today, the downward trend in range condition has been stopped on more than four-fifths of the lands that were deteriorating at the time of the Taylor Grazing Act in 1934. At the same time, Federal grazing lands are being put under effective permanent sustained yield management.

The task of restoring and rebuilding the Federal range will take years, but measurable progress already has been made. For example, on a million acres of artificially seeded public range, beef production has been raised from an average of 2 to 3 pounds per acre to 40 pounds per acre.

The long-term methods by which the Federal range will be brought up to full productive capacity involve construction of a wide array of range improvements—fencing, watering holes, storage tanks, and spring development. It will also involve seeding millions of acres of presently unproductive lands, substituting good forage for wildlife and livestock on millions of acres of lands now infested with low value forage plants and noxious weeds.

Wildlife management and conservation, along with other multiple range land uses, are integrated into patterns of grazing land use that are geared for the full productivity necessary to meet the growing needs of America's mounting population.

Mineral Resources

Population growth in the United States inevitably means an enormous drain upon our Nation's nonrenewable mineral and fuel resources. Coal, oil, and natural gas in ever increasing quantities will be needed to supply our energy requirements, while increased output of mineral resources will be necessary to supply the growing "hardware" needs of our civilization.

One thing is certain: More people in the United States will consume more mineral and fuel resources in the years ahead than in any previous period of our history.

It is estimated that per capita consumption of mineral products will increase by 40 percent by 1975. In the same period, we can reasonably assume that the rate of mineral and fuel consumption will be more than double the rate of population growth.

Mineral Interrelationships

If the relationship between minerals consumption and population were a direct one, it would be simple enough to look ahead to predictable levels of consumption of various mineral and fuel commodities. But such is not the case. The amounts of mineral raw materials consumed are dictated by other factors that are sometimes of greater significance than the number of consumers.

We have entered into a civilization based upon rapidly changing technology of increasing complexity. The replacement of human effort by machines and refinements that make our standard of living a thing of marvelous mechanical intricacy are all contributing to new and varied demands for specific commodities.

At the same time, the economics of production and utilization of some commodities have made competition among commodities a matter of very real significance. The substitution of one mineral or

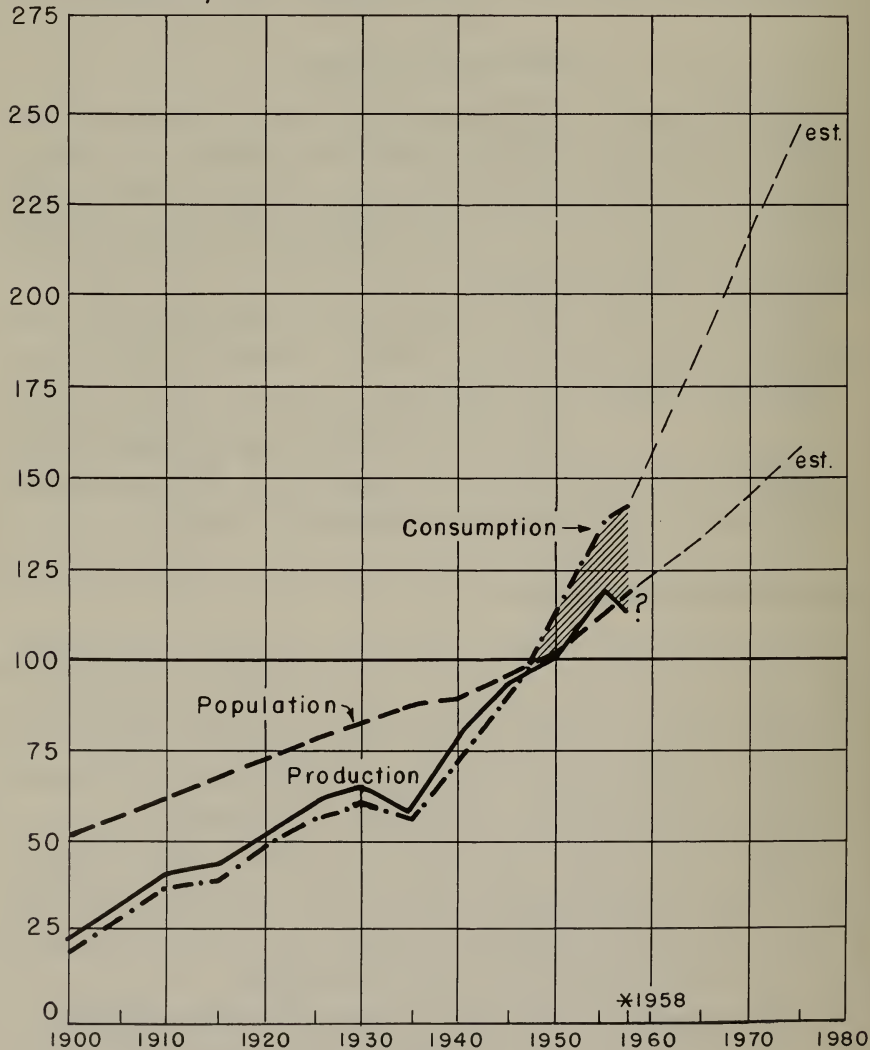
metal or nonmineral material for other mineral resources also is continually felt by the producers of minerals and fuels.

Population Not the Only Factor

Population growth alone is not enough to measure the future demand for minerals and fuel resources.

THE MINERALS PROBLEM TO 1975

INDEX NUMBERS, 1947-49 = 100



SOURCE BUREAU OF MINES

The per capita consumption of aluminum, for example, has increased many times in the past 10 years while the per capita consumption of copper has increased only modestly. It cannot be denied that the increase for copper would be much greater were it not for competition from aluminum.

Consumption of plastics and glass has increased at the expense of such materials as tinplate, and in turn, plastics have won markets from glass in the container industries. The prime historical example, of course, is the interaction of coal and petroleum and natural gas in satisfying our fuel requirements.

Consumption Outstrips Production

Although domestic production of minerals has increased markedly, it has not kept pace with the increase in consumption after World War II. Since 1900, consumption has increased by a factor of 7.5—production, by a factor of 5.5. The figure on opposite page illustrates the gap between production and consumption that is forever widening.

In the late 1940's, this country became a net importer of minerals and fuels. Since the population of the rest of the world is growing faster than our own, it is to be expected that consumption of minerals by the rest of the Free World will grow at an increasing rate over the years ahead. This will put considerable pressure on our overseas sources of supply of many minerals and intensify the problem of meeting our own rising demands.

Resources for the Future

Provision of mineral and fuel resources for an expanding population faces a series of challenges from dwindling reserves, expanding industry, and new and improved technology in other industries. Because such resources are nonrenewable, these challenges will force us to move across new frontiers of scientific knowledge in search of the solution to the ever lengthening lists of problems.

Horizons must be greatly broadened if these challenges are to be met. Thus far science and technology have learned to use only a fraction of the elements and substances that surround them in the physical world. The problems that must be solved by the minerals industries in the future will necessitate constant expansion of the basic sources of mineral raw materials. The ultimate goal will be achieved when means have been found to extract and utilize all elements and compounds from even the commonest and most abundantly widespread rocks, soils, waters, and the atmosphere.

The Department of the Interior, through its Bureau of Mines, provides much of the forward-looking scientific approach which is essential if we are to provide increasing supplies of minerals and fuel resources to meet growing demands.

Scientific Knowledge

The science of technology in mineral resources is necessarily coupled with scientific information concerning the discovery, appraisal, and systematic development of our mineral and fuel resources.

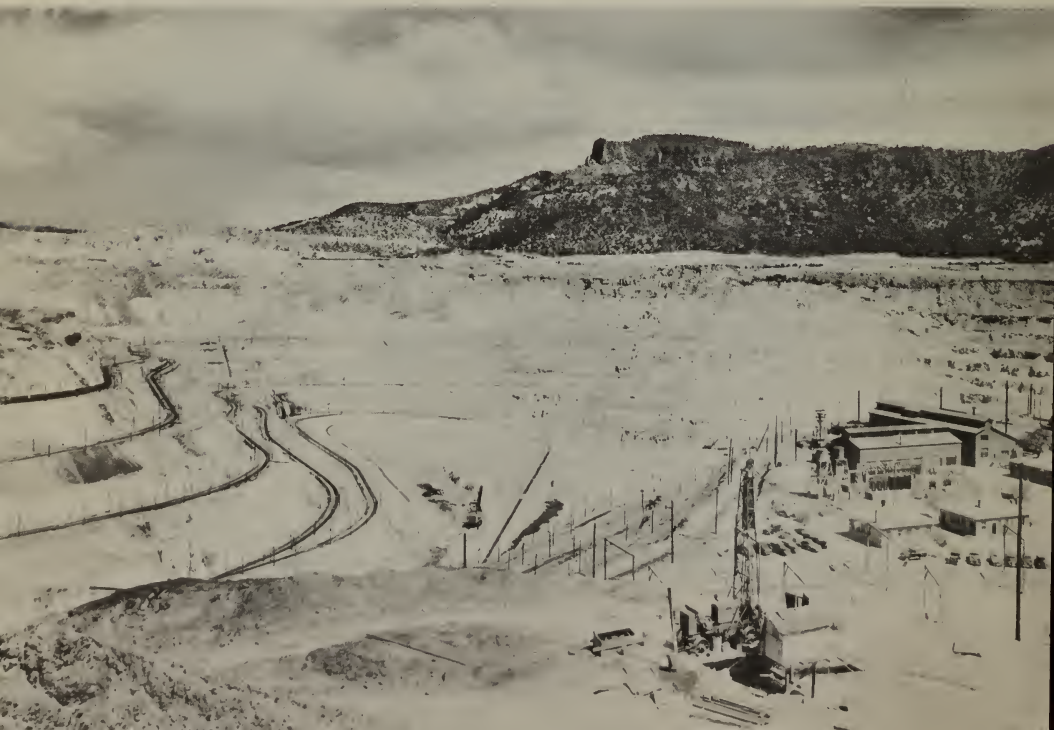
For the past 80 years, the Department's Geological Survey has been obtaining basic geologic data needed to supply the urgent mineral needs of our expanding population. Despite continual effort, the need for geologic data far outstrips the rate at which data are acquired.

As the population of the United States continues to expand, two avenues for supplying basic mineral and fuel resources are available:

Discovery and development of new deposits.

Better use of existing reserves through sound conservation, improved development techniques, and wise utilization.

Mining research pioneered by the Department of the Interior has resulted in extensive open-pit mining of lower grade mineral ores to meet the requirements of our expanding population.



To meet these requirements, geologic research by the Department in the mineral and fuel resource fields will emphasize: Systematic studies in areas favorable for mineral occurrence; evaluation of known and potential deposits; theoretical studies of the geologic processes that form mineral deposits; and continued research in minerology, petrology, photogeology, geophysics, and geochemistry to develop new and improved means in seeking mineral resources.

Mineral Exploration

New areas rich in mineral and fuel occurrence are becoming increasingly more difficult—and therefore more costly—to find in the United States.

Most of the easily found deposits have been discovered and developed, making the problem of maintaining an adequate level of domestic mineral supplies more difficult. It is essential that increased emphasis be placed on mineral discovery to meet growing needs in the decades to come.

Today, financial risks are so great that private industry, in many instances, cannot continue to search without Federal assistance for strategic or critical domestic minerals at a rate sufficient to keep pace with the Nation's mounting requirements. As a result, the Department, through its Office of Minerals Exploration, conducts a program to encourage exploration for needed minerals in the United States.

This permanent mineral exploration program in which the Department participates financially with private industry should continue to assist in developing new mineral reserves for the use of future generations.

Fuel Resources

To maintain and further the high living standards of the United States and to power our rapidly growing economy in concert with the heavy growth of our population will require the ready availability of increasingly large additional quantities of energy.

Widespread utilization of America's rich deposits of coal and its petroleum and natural gas began less than 150 years ago. The explosive growth in total energy demand in the last 50 years and anticipation of the continuation of this trend have focused increasing attention on fuel reserves, their conservation, and the evaluation of their capability for meeting the energy requirements in the coming years.

Projections of energy requirements based on an annual 3 percent per capita increase indicate that our energy consumption will be more than doubled between 1958 and 1975. The contribution by individual energy sources to meet the total demand will depend on reserves, production costs, and particular markets or uses.

Notwithstanding any adaptation of nuclear energy to the generation of electric power, the mineral fuels are expected to supply the preponderant portion of the increasing energy requirements.

Predictions indicate that coal eventually will have to contribute an increasingly greater share of energy supplies. The United States has the largest known coal reserves, more than one-third of the world total. These reserves can supply a major part of America's future energy needs.

Today, most fuel commodities are in adequate supply. The capacity of producers to meet the upsurge in demand for raw fuels after World War II is evidence that the mineral resource base of the United States and of the world has a much greater potential capacity than many earlier forecasters had anticipated.

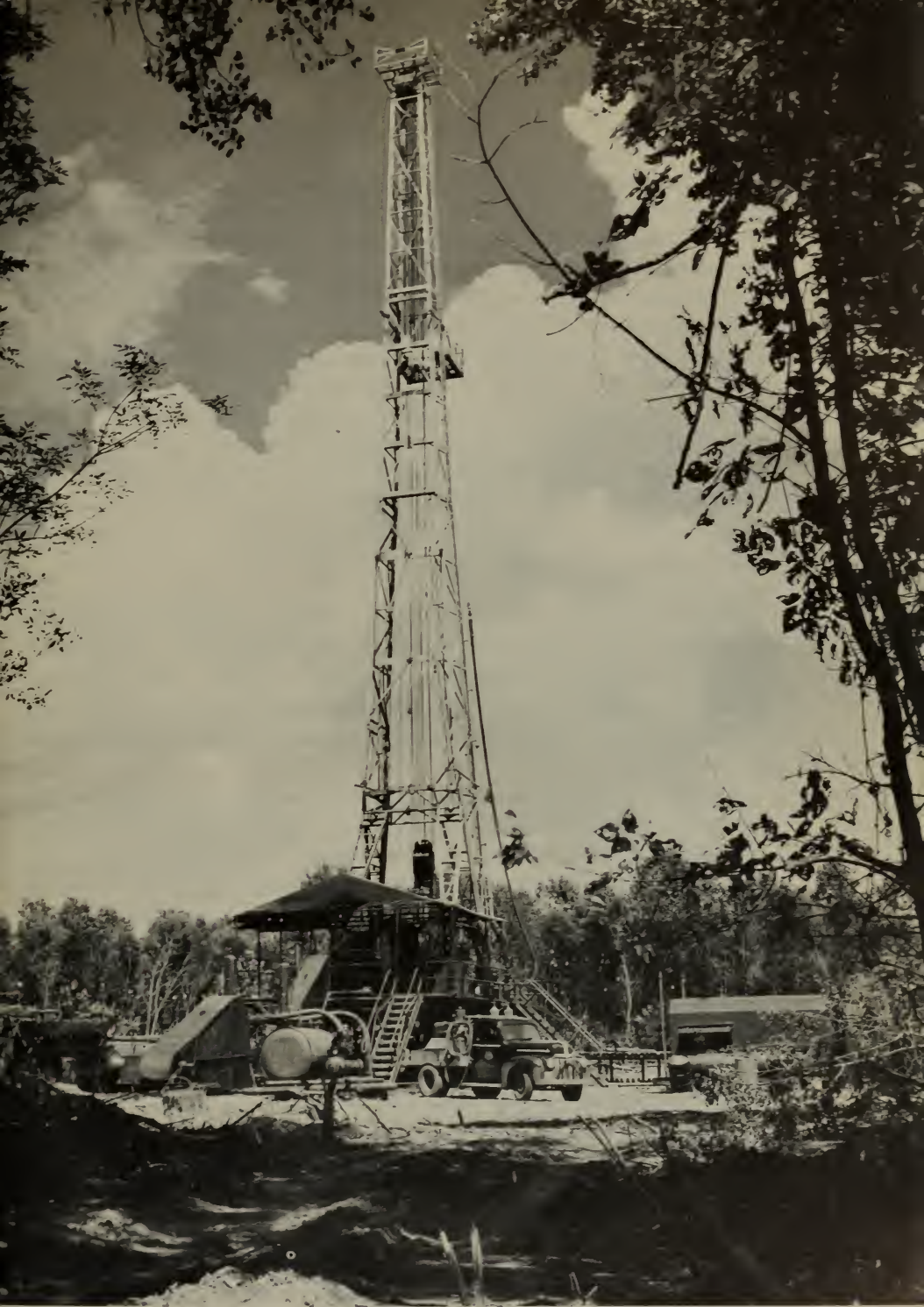
Indeed, for the foreseeable future, there would seem to be adequate fuel supplies to sustain an expanding economy. Nevertheless, wise use of these nonrenewable resources is essential in order to assure the welfare of future generations.

Oil and Gas Requirements

Although long-term trends indicate a percentage increase in energy requirements derived from coal, petroleum and natural gas will continue for many years to be the primary source of energy supply for our population.

Additional Americans in the years ahead will be heavily dependent upon our oil and natural gas resource reserves. Practically every human need is touched upon in some degree by the availability of petroleum products and natural gas. Recent growth is most conspicuous in the field of petrochemicals where new and increasing quantities of petroleum-derived materials are used in textiles, pharmaceuticals, and countless other industrial activities.

Concerned with the future supply of this fuel resource, the Department is undertaking a long-range petroleum study to evaluate the potentialities of United States petroleum reserves, productive capacity, consumption projections, and the use of petroleum and its products in 1975. This study—conducted by the Office of Oil



The Department plays a major role in the exploration, development, and conservation of the Nation's petroleum resources.

and Gas, the Bureau of Mines, and the Geological Survey, all agencies of the Department—is nearing completion.

The potential availability of petroleum in the United States seems sufficient to provide the bulk of our domestic requirements for many years. Estimates have been made that 240 billion barrels of recoverable oil may ultimately be developed in the United States. In addition, tremendous reserves of oil shale exist in this country which may exceed a trillion barrels.

While these figures seem reassuring, oil conservation, intelligent development, and efficient use of our petroleum reserves are essential to meet the needs of Americans in future years. Oil, like all other mineral fuels, cannot be replaced or renewed. Once used, it is gone forever, and under such circumstances there can be no justification for its use on a wasteful basis.

Our Shrinking Helium Resources

The consumption of helium has increased approximately five times since 1950, and today it is a valuable military, industrial, medical, and basic research tool contributing to the safety and welfare of our citizens everywhere. Unfortunately, however, while one of the most valuable of our natural resources, it is probably the scarcest.

Our known helium-bearing gas resources are concentrated within a small geographical area in the Texas and Oklahoma Panhandles and adjoining areas of Kansas. Moreover, no important new discoveries of helium have occurred in the past 15 years.

So far as can be ascertained, United States helium resources constitute the total Free World's supply. Unfortunately, continued production from known major reserves is unavoidable, because the natural gas containing helium is dedicated to commercial markets. At present we are recovering only a fraction of the helium so produced.

The helium-bearing gas fields contain about 120 billion cubic feet of recoverable helium—350 times the present annual consumption of helium in the United States. But all of these fields are being produced to supply fuel gas markets, and about 4 billion cubic feet of helium is being wasted annually when the gas is consumed in domestic and industrial furnaces. At the current rate of loss, and with increasing consumption, the presently known helium-bearing gas fields would be incapable, after 1985, of supplying enough helium to meet all of our needs.

Conservation Program Under Way

Consequently, the Department has requested legislation for a helium conservation program designed to conserve approximately 32 billion cubic feet of helium between now and 1985.

The program calls for the construction of 12 additional helium extraction plants as soon as possible to remove helium from natural gas going to fuel markets. Helium, so conserved, will be stored until needed in the Government-owned Cliffside Field near Amarillo, Tex.

It is hoped that incentives will permit private industry to finance, construct, and operate these plants to produce helium for sale to the Government. If private participation proves infeasible, however, the necessary new extraction facilities will have to be constructed and operated by the Department's Bureau of Mines.

Waste Recovery

While mineral resources are not renewable there is always the possibility of more than a single use for a given supply. This comes about by recovery of scrap and reclamation of the valuable constituents it may contain. Many commodities are now being shunted to the waste pile as discards from various production processes.

Some—such as gallium—have been victims of low demand, though new uses for gallium are just now coming to the fore. Others, like sulfur, are being recovered at some plants, but are being lost at others. The proper selection of material for uses can do much to conserve supplies. The use of corrosion-resistant materials eliminates the wastes that come from oxidation by the atmosphere and the cost as well as the material required for protective surfacing.

Mineral Recovery

The quality of mineral resources continually declines as the best deposits are mined. One of the principal elements of Departmental research is directed particularly toward increasing production from currently submarginal deposits—those that appear likely to be called upon in the next 20 to 100 years to meet the Nation's growing mineral requirements.

Frequently, submarginal deposits are enormous in size and if economically workable would be able to fulfill large demands. Often they are not only low in desirable mineral content but have the added disadvantage of being complex and difficult to treat metallurgically.



Department research in the fields of mining techniques and equipment has led to both governmental and private development of efficient machinery to mine coal and other minerals.

A good example of the attack being made on such deposits is found in bauxite, the raw material for aluminum production. Domestic supplies of this valuable mineral are very limited, forcing the United States to import most of its high-grade bauxite from abroad. However, in Hawaii there are immense low-grade bauxite deposits which have received preliminary examination and metallurgical tests that have led to a cooperative program with the State of Hawaii to measure more accurately the potential of this huge resource.

Much more attention also must be given to improving the techniques of exploration and their wide application, for these techniques can recognize evidence of deposits that do not reach the surface. A half-billion-ton, deep copper deposit near San Manuel, Ariz., was found by Bureau of Mines exploratory drilling based on slight surface mineralization.

Coal Recovery

Coal-mining conditions in the Eastern States will inevitably become more difficult and techniques must be developed to overcome new problems in recovering coal from the ground. Although advances in mechanization and productivity have been significant,

safer and better procedures for mining and transporting coal are still needed and are being sought in the Department's research program.

In the Western States, emphasis must be placed on increased recovery to avoid leaving large quantities of coal in the ground.

Petroleum Recovery

The Department of the Interior has provided leadership through research in developing technology to increase the yield or recovery of petroleum from underground reservoirs. This means producing more barrels of oil per acre and is part of a broad conservation program that is assisting industry to supply increasing amounts of natural resources to our growing population.

Improved recovery techniques resulting from such research are increasingly important to maintain adequate proved reserves because it is becoming more and more difficult and expensive to discover new reserves. In recent years, new reserves resulting from exploratory drilling have not been as encouraging as in former years.

This does not indicate necessarily that the country is running out of oil. In fact, total proved reserves are at an all-time high, but this is due mainly to oil proven by extensions of fields and revisions of earlier estimates for known deposits. Increased recovery or yield resulting from the application of better production techniques is an important factor causing the upward revision of previous estimates.

Research was the forerunner of this favorable situation and more research will be needed to develop even better recovery techniques, so that petroleum can be produced in ever-increasing volumes to satisfy the continuing upward trend in demand that is being created by our growing population.

Extraction and Utilization

The advances of the past half century in the science of extracting mineral raw materials from lower-grade deposits have been remarkable. Just as noteworthy have been recent developments that have permitted the extraction and utilization of many of the more esoteric metals that were unknown to commerce 25 years ago.

Department research provided the Nation with titanium, zirconium, and hafnium. In the foreseeable future, industrial supplies of hyperpure metals such as yttrium, vanadium, cerium, chromium, and tungsten may become reality through research fostered and conducted by the Bureau of Mines.

Coal Utilization

To insure optimum utilization of coal and our ability to meet the needs of a dynamic society, a comprehensive coal research and development program is underway, directed toward insuring the ability of coal to retain its share of the energy market, exploring the possibility of expanding this share as other fuels become scarcer and more expensive in the years ahead, and evaluating alternative nonfuel uses of coal.

Improved preparation practices will be needed to permit satisfactory utilization of dirtier and finer-sized coals.

Although coal-derived liquid fuels are not now competitive economically with petroleum products, extensive research has indicated that their costs may be reduced. In addition, the potential application of nuclear energy to gasification of coal, as well as a study of the effects of irradiation of coal, is now being investigated.

Ways will eventually be found to use our vast reserves of low-rank lignite as effectively as coals of higher rank. Coal will eventually be the earth's most abundant source of organic compounds that will be needed for producing chemicals and pharmaceuticals. New techniques for separating, identifying, and upgrading these coal products must be, and are being, developed.

Substitutes and Synthetics

Another attack on the problem of future mineral supply is through research on substitute, alternative, and synthetic materials.

In the Department, special attention is focused on use of abundant resources as substitutes for minerals that may be in short supply. New metallurgical techniques are sought to relieve dependence of iron production on the shrinking supply of metallurgical-grade coal.

Copper may be replaced in some uses by more-abundant aluminum. Abundant anhydrite may, through research, become an economic domestic sulfur-source material.

Research on synthesis of asbestos and mica is aimed toward improving the domestic supply of these strategic materials. Such research on synthesis of nonorganic compounds may well have broader implications in relieving man's dependence on scarce natural sources for many industrial minerals. In some instances, materials are synthesized that are superior to naturally occurring minerals.

Substitution and synthesis offer many intriguing possibilities for the future. Such metals as iron, silicon, magnesium, aluminum, sodium, calcium, and potassium are available in common rocks and in the oceans in quantities that beggar our consumption require-

ments. Perhaps the day will come when they will become the basis of our industrial civilization instead of the traditional copper, tin, zinc, lead, and ferroalloy metals.

Human Resources

The Indian people of the United States are by no means a vanishing race.

When the North American continent was discovered, the Indian population was, according to the best available estimates, in the neighborhood of 800,000 to 1,000,000. For a period of years, the Indian segment of our population dwindled, and Census Bureau records show a low point of approximately 250,000 was reached in 1880.

Today, the Indian population—both on and off reservations—is estimated to be over 550,000. Evidence indicates that the rate of population increase in most tribal groups is now higher than the growth rate for the entire United States.

In recent years, there has been increasing population pressure on the physical and natural resources of the Indian reservations. As a result, a growing tendency exists for the Indian people to look for other means of livelihood apart from the land. For example, on the large Navajo reservation, the income of tribal members from agriculture and stock raising is only about 11 percent—compared with approximately 58 percent as recently as 1940.

Relocation Progress

Similar though less pronounced shifts away from the land are undoubtedly occurring in other tribal groups. In many cases, Indian families are leaving reservations to move into the mainstream of American life. In other instances, the land will no longer adequately support the growing Indian population.

This movement of the Indian people away from dependence on the land into other fields of human activity constitutes a major reason for the Department's programs to develop industry adjacent to reservations, to aid Indians who voluntarily leave their reservations, and to train Indians in skilled occupations through adult vocational schooling.

While dependence on land is lessening and the lands held in trust for the Indians constitute less than three percent of the total area of the United States, their wise use and development are of utmost importance to those who remain on tribal lands.

Human Resources

The Department recognizes that the development of human and physical resources must go hand in hand. With this premise in mind, all special programs for Indians carried out by the Bureau of Indian Affairs are focused on the development of Indian potentials.

Over half of the annual appropriations made by the Congress for Indians is allocated to education programs and school construction specifically aimed at the development of Indian talents to the end that Indians may take advantage of opportunities wherever they exist, either on or away from their reservations.

Even the underlying purpose of the resource programs carried out on Indian reservations is a human purpose—to teach Indians how to conserve, manage, and better utilize the physical resources they own.

The Department sees its responsibility to Indians as being uniquely a responsibility for the development of people and the programs carried out are designed to give Indians the know-how to face the problems of modern living.

Changing Patterns

In the past most Indians were content to follow a simple way of life in cultural isolation on their reservations. This is no longer true. Indians today want better opportunities for themselves and their children; better education, better health; better standards of living; and an active part in determining their own destiny.



Developing Indian resources to meet the needs of the expanding Indian population requires increasing emphasis on education of Indian youth.

To achieve these legitimate aspirations, most Indians living on reservations must overcome two major roadblocks: (1) the imbalance between rapidly growing population and their resource base, and (2) the serious educational gap between Indian populations who have lived for several generations in cultural isolation, and the general population.

Upsurge in Education

Since education is the key to Indian advancement, the growing upsurge of Indian interest in education is most heartening. Indian parents, educationally disadvantaged themselves, are demanding better educational opportunities for their children and are learning how to participate in the management of their local schools.

Increasingly, Indian children are enrolling in school at the proper age, attending school more regularly, and staying in school longer. More and more of them are enrolling in public schools. This increased interest in education places a strain on already crowded Federal and public facilities, and makes it necessary to gear school construction and instructional programs closely to growing needs and requirements.

Indian youths in greater numbers are attending school beyond the high school level in both vocational and college courses. Federal grant programs and tribal scholarship and loan programs assist the college-bound youth, and the Federal adult vocational training program provides educational opportunities for Indian adults between the ages of 18 and 35. Special programs of the Department for educationally disadvantaged adults designed to upgrade their literacy and educational competency are well received by Indians.

No longer is the Indian satisfied to have his destiny shaped for him; no longer is he indifferent to education. In consultation with him, the Department gears its programs to his special needs and helps him develop the understandings, the skills, and the capital he needs to achieve his goals.

Land and Water Resources

Out of the total of approximately 53,000,000 acres presently held in trust by the United States for Indian tribes or individual Indians, an aggregate of about 34,500,000 acres is now being used by Indian people for the production of crops or livestock and another 9,500,000 acres is being used for the same purposes under lease or grazing permit.

To help the Indians in realizing the fullest possible income from their land and water resources, the Department carries on two major kinds of activity. First, it provides technical guidance to Indian operators in farm and range management, in soil and moisture conservation, and in the operation of irrigation projects. Secondly, it works with Indian people in bringing new lands and additional water supplies into production and in raising the available land and water resources from a lower to a higher state of use.

In this latter field, Departmental programs continue to bring desert or semiarid lands under irrigation in both old and new projects. In some cases, this means agricultural production where previously there had been none. In other instances, the change is from grazing values of a few cents per acre to cultivated crops which may be valued at over \$100 per acre.

At the same time, efforts are being launched on a number of reservations to make a complete inventory of the available resources as a basis for more comprehensive development and utilization programs.

Forests

More than a fourth of all Indian trust lands, about 14 million acres, is classified as forest and woodland. These timbered lands are an important factor in the Indian economy. They provide fuel and other wood products for local consumption; they produce forage for livestock; and, in some areas, they provide game, fish, berries, and roots for tribal use.

Six million acres of these lands, classed as "commercial" forests, are producing important cash income for the Indian owners. During the past 50 years, these forests have been consistently managed according to sustained-yield principles and have produced a harvest of 22 billion board feet of timber valued at more than \$155,000,000.

For many years, the forestry program of the Bureau of Indian Affairs was handicapped by inadequate, incomplete, or outmoded information concerning the extent and quality of the timber growth on Indian lands. As a result, the timber was harvested in most areas on an extremely conservative rather than a full-utilization basis.

During the past decade a determined effort has been made to eliminate this deficiency. A program of forest inventories has been initiated to determine the volume, condition, and growth potential of the forests. Aerial photography and other modern techniques are being used in developing this information. As the inventory for each reservation is completed, a new plan of forest management and new cutting schedule are prepared and put into effect.

New inventories and management plans have now been completed for about 25 percent of the commercially important Indian forest lands and are under way on an additional 50 percent.

Minerals and Fuels

In comparison with other resources, the minerals in Indian lands—particularly oil and gas—have by far the greatest income-producing potential. In fiscal year 1952, the total income to Indians from oil and gas leasing of their lands was about \$19,125,000. The comparable figures for the fiscal years 1957 and 1958 were \$72,616,000 and \$55,210,000, and \$46,587,458 in 1959.

In large part, the increases have been accounted for by high bonuses offered during the past few years for leases on Navajo lands



Water conservation on Indian lands is an important aspect of the Department's program for effective use of Indian resources by Indians.

in the "Four Corners" area of the Southwest where Utah, Colorado, Arizona, and New Mexico meet. Other tribal groups, however, have also benefited from mounting interest in oil and gas leasing of their lands, and the development of uranium has added significantly to the income of groups such as the Navajo Tribe and the Pueblo of Laguna in New Mexico.

A noteworthy aspect of the Navajo development is the fact that a substantial portion of the income realized from oil and gas leasing of the tribally owned lands has been channeled into programs to make more effective use of other tribal resources.

Funds have been budgeted, for example, to construct a new saw-mill on the reservation which will permit the tribe to take full advantage of the increased timber harvesting that has now been scheduled as a result of a new forest inventory.

Water resources on the reservation range have been more fully developed and a special program to train tribal members in the techniques of irrigation farming has been launched.

These are only a few of the ways in which income from mineral leasing of Indian lands has been used to benefit increasing tribal populations. In the future, if production of oil and gas measures up to expectations and brings in greater royalties, still broader programs of a similar nature will be undertaken.

Hoping to keep as much Indian land as possible in Indian ownership, the Department in 1959 recommended major amendments of S. 51, a bill dealing with the sale or leasing of land owned by two or more Indians. One change would increase the Indian Bureau's \$10 million revolving loan fund to \$25 million. The additional money would be available to tribes to buy up Indian land which otherwise might be sold to non-Indians. The other amendments would give individual Indians or tribes a preferential right to purchase tracts put on sale.

Territorial Growth

Economic progress in the territories of the United States is the key to improved living standards for our increasing insular population. Progress depends upon careful and sound use of available resources, attention to modern skills and techniques, and introduction of new industry.

Meeting this challenge is an important and continuing responsibility of the Department of the Interior through its Office of Territories.

In few areas under the American flag is resource development for future generations a matter of as great importance as in the island possessions of the United States. The territorial areas under the jurisdiction of the Department of the Interior total approximately 1,130 square miles of land inhabited by more than 152,000 persons—about 135 persons per square mile.

Limited Resources

The Virgin Islands, Guam, American Samoa and the Trust Territory of the Pacific Islands contain neither large land areas, significant forests, nor minerals or fuels of commercial importance. In these islands, scattered across the Pacific and in the Caribbean, natural resources that can be used for economic development consist essentially of arable land and the products of the sea.

Climatic conditions impose definite limitations on agriculture. Opportunities for diversification are few, and these island areas have passed the stage of development where the food needs of their people can be wholly met through local production. In varying degrees, each must import food and other essential commodities in exchange for the sale of local products or services.

Island Problems

Guam and the Virgin Islands, in particular, import a large part of their food requirements. In all cases, however, programs are in effect to solve technical problems and to encourage increased production of foods and commercial crops.

In the Virgin Islands, this effort is hampered by limited rainfall and the principal agricultural effort centers on sugar cane, a major commercial enterprise. The Virgin Islands Corporation—a Federal corporation that aids small farmers, purchases and grinds their cane, and raises sugar cane upon its own lands—is the prime mover in the effort to increase production.

American Samoa and the Trust Territory of the Pacific Islands rely upon copra as their cash crop. Programs are under way to increase copra production, to improve local crops, and to introduce secondary cash crops, such as cacao in the Trust Territory.

Tourism and Travel

While climate has a limiting effect upon agriculture, it has substantial compensating benefits as witnessed by the tremendous growth of the tourist industry in the Virgin Islands. Tourism has become a mainstay of the Island's economy and its further development is actively encouraged.

American Samoa may also benefit from tourism through the construction of a new airfield to accommodate jet aircraft on South Pacific air lanes. Once an important port of call on the sea lanes, American Samoa may well become an important stop for air travelers of the future.

Fishery Resources

Conservation of marine resources has been initiated in the Trust Territory where trochus shell constitutes an important source of income. Sanctuaries and harvesting seasons have been established to protect this shellfish, which inhabits the reefs. A pilot fishing operation has been started to train Micronesians in deep sea fishing, and a major objective is the possible canning of fish to supply local markets that now rely upon imports. In American Samoa a deep sea fishing training program already is well under way.

Water Problems

Expanding population and economic development focus attention on the need for adequate water supplies in island areas and Department programs are giving particular attention to this requirement. For example, the Government of American Samoa and the Geological Survey recently cooperated in surveying additional sources of potable water.

In the Virgin Islands a critical shortage of potable water is faced by the Island of St. Thomas where the supply was maintained through the year only by virtually continuous barging of water from Puerto Rico. Salt-water distillation will eliminate this costly operation. Subject to Congressional review of plans, construction has been authorized of a plant to produce a minimum of 250,000 gallons of water daily with electric power as a byproduct. A contract has been signed for planning and design of the plant. The Virgin Islands Corporation will operate the facility and sell water to the Virgin Islands Government for distribution.

Continuing Alaskan Responsibilities

In Alaska, which was admitted into the Union as a State at the midpoint of the fiscal year, the several resource agencies of the Department of the Interior will continue their important functions, although in some cases statehood results in changed emphasis.

For example, the Alaska Railroad, operated by the Office of Territories, will play an important role in the further development of the new State. In order better to serve the Alaska population, its businesses and industries, the Railroad is continuing its program to improve equipment and facilities.

Transportation in Alaska, as elsewhere in our territorial possessions, is a key factor in improving the living standards and economic opportunities for the increasing population of these areas.

Fish and Wildlife Resources

Together with the enormous upsurge in population, quick transportation, repeating guns, better ammunition, electrical aids in fishing, and many other instruments and implements have immeasurably increased recreational use of our Nation's precious wildlife resources. Wildlife habitat has dwindled to a fraction of what it was some decades ago, and there is an increasing demand upon the supply of fish in our oceans.

Under these conditions, it is readily apparent that the task of the Department's Fish and Wildlife Service in seeking to assure adequate wildlife resources to meet growing future needs is a most difficult one.

Three Primary Goals

Consequently, in its wildlife programs, the Department has set three primary goals: Maximum production, intelligent harvest, and highest utilization.

By spotting and studying new fishing grounds, the Department constantly enlarges known commercial fishing areas, thereby increasing the ocean food supply for American tables.



Achievement of these goals will mean:

First, that with greatly reduced wildlife habitat the Nation will have a wildlife supply rivaling that which it had in the days of the primeval forest;

Secondly, that the resources will be harvested in such a way that there will always be enough left to continue the species; and,

Finally, that there will be no costly waste of wildlife resources through nonuse or misuse.

Cooperative Effort

Other agencies and other forces are working energetically with the Federal Government in this cooperative aim.

Day by day, an enlightened public is becoming more conservation-conscious. An ever-increasing fund of pertinent scientific information is being developed, of which the Department contributes its proportion. A number of other Federal agencies are presently considerably more concerned with wildlife conservation and development than formerly. State conservation agencies and numerous private conservation groups put perpetuation of fish and wildlife at the top of their activities, and other public and private organizations list such activities prominently in their programs.

The drive to safeguard and develop wildlife resources goes on unceasingly on land and sea. In this effort the Department's Fish and Wildlife Service performs important duties in its own specific field of responsibility, while at the same time sharing cooperative responsibility with the 50 States and a score of Nations.

Numerous Channels of Activities

The avenues along which the Service works to meet recreational needs include oceanographic studies, biological and technological research, river basin and water project planning, improved management practices, research on chemical controls, Federal aid to States, and cooperative activities.

Implements involved in the program include nearly 18 million acres of National Wildlife Refuges; a hundred fish hatcheries; nearly two score laboratories devoted to various phases of fish and wildlife research; a fleet of research, exploratory and law enforcement vessels; half a hundred planes, a wide range of equipment, and a staff of professional and technically trained employees.



Game biologists of the Department of the Interior often do unique chores in their efforts to insure our game population is sufficient to meet the hunting pressures created by expanding population.

Probing Secrets of the Sea

In recent years the probing of the secrets of the sea has been accelerated, and the Department of the Interior has been among the active agencies in this field. As the work progresses, the Department expects to help unravel some of the mysteries, such as those surrounding the life and death of many species of food fish, and in the end to make the production of food in the ocean as scientific as the growing of grain and livestock on farms. But before that goal can be achieved, there must be more knowledge of the life history and migration of the various species of fish; more knowledge of the food chain, how it starts and how it develops; and more knowledge about the composition of ocean water, about its thousands of currents, the effect of temperature and light and waves and weather and countless other things of which presently little or no knowledge exists.

One major breakthrough in marine biology is believed near at hand in the development of methods by which American salmon can be identified as distinct from Asian salmon, and the charting of the migrations of these races to show when and where and to what extent they intermingle. This huge task is being undertaken by scientists of three Nations, and when complete, will be the base upon which management plans of two continents for securing the maximum sustainable yield of salmon can be built.

Growing Practice of Chemical Control

In the rapidly growing field of chemical control, the Department's Fish and Wildlife Service has begun a broad scale investigation of the effects of the 200 obtainable pesticides, insecticides and herbicides upon America's fish and wildlife resources. The purpose of this study is to meet agricultural pesticide needs without seriously depleting the fish and wildlife which might be subjected to their uses.

A field of chemical control which has been pushed vigorously by the Service is that of selective control. Painsstaking research in which 5,000 chemical formulations were tested by the Service resulted in poisons which would kill the dreaded and destructive sea lamprey larvae without damage to desirable varieties of fish. This success has led to a wide search for selective toxicants for the control of other predators.

Another chemical success has been achieved in developing repellants which protect seeds and seedlings without harm to wildlife, thus helping to overcome a serious agriculture and reforestation



Through wildlife research and management, the Department of the Interior preserves and improves wildlife habitat and breeding grounds so that hunting and fishing facilities are available for America's increasing millions.

problem, while at the same time protecting wildlife resources. In one area, the reforestation cycle has been cut from 10 to 20 percent because of the protection given to seeds and shoots and young stock.

Conservation in Water Development Projects

Through the persistent efforts of conservation agencies, both public and private, the protection and development of fish and wildlife

resources has taken an important place, guaranteed by legislation, in the planning of water development projects and in the development of river basin areas. The importance of protecting and enhancing fish and wildlife resources in agricultural and industrial developments is, as a result, becoming a fixed American practice.

At the same time, the Department's Fish and Wildlife Service is moving toward more effective management of its own resources. Research, bird banding, and improved survey techniques are resulting in more reliable waterfowl inventories. Better management of

Preservation of America's important salmon fishery resources cannot be left to nature, and salmon on the tables of American homes often get their start in life in Departmental fish hatcheries.



refuge areas is making it possible for many refuges to carry from 2 to 10 times as many birds as formerly. Elimination of noxious weed growth in some places has had the effect of adding hundreds of acres to the refuge system. Research on commercial fishing grounds is leading to mesh-size limitations which prevent the catching and loss of fish too small to market.

To protect the duck population in the face of shrinking water supplies, the Department's programs are often geared to make water do double duty. This is accomplished in a variety of ways—by adding a few feet to a dam to flood an area in spring highwater and thus have a duckfood producing area after the summer draw-down; by utilizing water without consuming it as is done when water is run through a marsh to freshen it and then returned to the stream; by reclaiming water which is polluted by urban or factory wastes; or by managing certain areas in such a way that ducks can get value out of waters which would otherwise stagnate or evaporate.

Federal Aid to States

Under the Federal Aid program, funds are channelled through the Department to the several States, which in turn conduct research and management programs on their own fish and wildlife resources. The program in actuality has a double effect—it not only assists the States in producing more fish and game, but at the same time it helps in the establishment of professional fish and wildlife staffs in every section of the country.

The Department's aim in its many related programs in the fish and wildlife field is to preserve and expand our wildlife heritage so that Americans of the future, as well as today's citizens, will know and appreciate the wildlife world of John Audubon and Daniel Boone—the world known and beloved by all our forefathers.

Recreational Resources

Probably in no other area of National life are the immediate demands being placed on an invaluable resource by the explosive nature of population growth more dramatically illustrated than in the increasing pressures on America's recreational resources.

The growth of population over the past few years provides some startling statistics. Population growth, however, does not begin to approach the corresponding rate of increase in outdoor recreational activities by countless millions of Americans.

In our national parks, for example, there were just 1 million visitors in 1920. By 1958, this figure increased to 60 million—an

increase of 6,000 percent, far outstripping population growth itself. By 1966 park visitation is expected to exceed 80 million.

The Department of the Interior through its many agencies—the National Park Service, the Bureau of Reclamation, the Fish and Wildlife Service, the Bureau of Land Management, and the Bureau of Indian Affairs—is taking urgent action to meet the recreational needs of our citizens today and to provide recreational facilities for Americans of the future.

Each agency is working earnestly to meet the mounting pressures on our recreational resources which population growth and increasing leisure time will inevitably bring.

Positive Needs

A number of factors in our national life have contributed to the astonishing trends for expanded use of Federal, State, local and private recreational resources.

First, of course, is the dynamic rate of population growth itself. Along with this, unparalleled prosperity since the end of World War II has resulted in increased disposable family income and greater leisure time for our people. These factors, coupled with accelerated improvement in our network of roads and highways, have made Americans a traveling, sightseeing people intent on knowing and enjoying the scenic, historic, and outdoor resources of their Nation.

These facts have led recreational planners at all levels of Government to take new, forceful steps to preserve and improve existing recreational resources and to develop additional resources to cope with the constantly increasing population pressures on recreational facilities.

Positive Programs

The agencies of the Department of the Interior—either as a prime function or a corollary activity—have been in the vanguard of those seeking to provide wholesome recreational facilities for all Americans.

The National Park Service with its 10-year program, Mission 66, is making progress in preserving, protecting, and improving the national park system.

The Bureau of Reclamation, whose prime responsibility is development of irrigation for the water-hungry West, is creating manmade lakes, thereby establishing new water recreational facilities in the arid areas of our Nation.



The national parks of the Department of the Interior provide scenic majesty and wholesome outdoor recreation for millions of Americans annually.

The Fish and Wildlife Service, through its Bureau of Sport Fisheries and Wildlife, carries out far-reaching programs designed to provide abundant supplies of fish and wildlife for recreational hunting without permanently depleting our wildlife resources.

In less spectacular, but equally important ways, the Bureau of Land Management and the Bureau of Indian Affairs are making positive contributions to improving and increasing the recreational facilities of America for present and future generations.

The Challenge

Unfortunately, however, at the time of greatest need for recreational resources, some of the prime areas for recreational use are vanishing from the face of the earth.

Population means people—and people need land for housing, for roads, for shopping centers, and for industry to meet the demands for a constantly higher standard of living. Everywhere across the Nation, the swelling tide of people and the 20th century phenomenon known as “urban sprawl” is swallowing up America’s open spaces from coast to coast.

For example, the critical scarcity of land for public recreational use is illustrated by the loss of unspoiled shoreline areas. Twenty-five years ago, the Department's National Park Service surveyed our seashore resources, listing 12 areas as most deserving of dedication for public recreational use.

One of these areas, Cape Hatteras National Seashore Recreation Area, has been established but 10 of the remaining 11 are in various stages of private or commercial development.

In 1954, another survey showed that almost every worthwhile shoreline area accessible by road—on the East, West, and Gulf coasts, as well as the southern portion of the Great Lakes—is being rapidly filled by private resorts, estates, suburbs, and commercial developments.

A Partial Answer

For the country as a whole, there is only 1 mile of shoreline for public recreation for every 220,000 people.

In the past year, the Department requested Congress to approve legislation which would permit preservation of some of the remaining shoreline area of the United States. Legislation now introduced would authorize appropriation of \$15 million to acquire three additional national shoreline areas.

There are also hundreds of smaller areas which provide excellent opportunities for public use and enjoyment and are most suitable for administration by the States—areas which are also being withdrawn from public use through other pressures.

The National Park System

Working to provide additional public shoreline areas is only one phase of a concerted Department effort to meet the recreational needs of our growing population.

Mission 66, a long-range program of the Department instituted in 1956 and administered by the National Park Service, will provide for the conservation, protection, improvement, and expansion of our national park system to meet inevitable population pressures on park resources.

The National Park Service—which administers 181 areas of scenic, scientific, or historical importance—has made rapid strides in restoration and development of park areas.

When Mission 66 was inaugurated, our parks were neither staffed nor equipped to protect their irreplaceable features, nor to provide proper facilities for the increasing millions of visitors. Lodging

and eating facilities were inadequate and outmoded. Interpretive services for proper park enjoyment were lacking while priceless park features were deteriorating.

Mission 66—which will be completed in 1966, the fiftieth anniversary of the Department's National Park Service—will insure that our national parks, monuments, and shrines will be adequately protected for the benefit of present and future generations.

Mission 66 Progress

In the first 3 years of operation of Mission 66, the National Park Service has increased park staffs to provide proper protection of natural park features and to facilitate service to the mounting tide of visitors.

Through the investment of over \$100 million, the National Park Service has provided new and better park roads, trails, parkways, visitor centers, museums, campsites, utility systems, and a variety of interpretive services throughout the Nation. The sign, "A Mission 66 Project," has become a familiar landmark to millions of traveling Americans.

During the same period, private enterprise has invested more than \$17 million to provide new hotels, lodges, motels, restaurants, and other accommodations which allow park visitors to do more than merely drive through park areas.

While this phase of Mission 66—and its continuing additions to park facilities and capabilities—is meeting the more pressing needs, the National Park Service recognizes that new ways must be found to expand recreational resources and to save additional unspoiled lands for park additions.

Mission 66 Planning

Accordingly, the National Park Service is reappraising the Nation's outstanding scenic, scientific, historic, and cultural resources.

Work is in progress to inventory and to evaluate the factors that affect public demand for these facilities—population shifts, transportation patterns, trends in recreational habits and interests, and present and potential uses of our recreational resources.

Results of this intensive planning and survey effort will not only permit efficient park planning over the years ahead but also will provide basic data for the National Outdoor Recreation Resources Review Commission in its study of future requirements for total outdoor recreational opportunities and its formulation of long-range policies and programs to meet these needs.

The Commission—composed of four Senators, four Representatives and seven citizen members—will inventory and evaluate total national recreation resources and the needs of the Nation for the years 1976 and 2000. Its work will go far in coordinating and improving recreational resource efforts at all levels.

As part of the survey work in progress, studies are being made of the basic adequacy of the National Park System itself and the individual areas which comprise it.

Historic and Cultural Resources

The National Park Service has also reinstituted its National Survey of Historic Sites and Buildings which was discontinued during World War II. By producing an authoritative document identifying, describing, and evaluating archeological and historic sites and buildings of national significance, the survey will accomplish three significant objectives.

It will aid the Federal government in determining its proper role in historic and archeological preservation and will provide a basis for development and interpretation of these resources.

It will provide information for guidance in the use and disposal of surplus Federal property containing historic and archeological values not currently protected.

It will develop basic data for State, local, and private historical bodies in their activities to conserve significant sites in the Nation's history and prehistory.

The survey is a step forward to insure that our children's children will know, understand, and gather inspiration from the places which shaped our Nation's history and progress.

Recreation on Wildlife Lands

In 1958, the latest year of record, the national wildlife refuge system administered by the Department's Fish and Wildlife Service recorded more than 9 million visitors—in contrast with nearly 3.5 million in 1951.

While the recreational use of wildlife lands is limited to those areas where such activities will not interfere with wildlife protection and propagation, this increase in visitation of 170 percent in 8



Increasing millions of Americans are visiting the national parks annually. Mission 66, the Department of the Interior's long-range park development and protection program, is designed to meet the demands of our population on the parks.



Mission 66, the Department of the Interior's program to expand park facilities to meet population growth, preserves and protects our scenic, historic, and wilderness resources. Here, visitors register for tour of Abraham Lincoln National Historic Park.

years indicates the role our national wildlife areas will play in meeting the recreational needs of the future.

Americans flock to the wildlife refuges for many purposes—to fish, swim, picnic, to hunt under controlled management plans, and to observe and photograph birds and animals in their natural habitat.

The use of wildlife lands for recreational purposes represents another aspect of the Department's multiple-use policy in administering our natural resources. While preserving and protecting the refuges for their primary purpose, the Department encourages the secondary use of these recreational lands in the Nation.

It is the wise use of lands which belong to all Americans such as typified by the recreational use of wildlife areas, which will insure added resources to meet outdoor requirements of Americans of today and tomorrow.

Recreation on Public Lands

Under the Taylor Grazing Act, the vacant public domain is open and available to the public for hunting, fishing, camping, and other recreational use. Every year, countless thousands make use of these lands for outdoor recreation.

To help meet the expanding recreational needs of our increasing population, the Department's Bureau of Land Management administers an active program to provide public land to local, State and national agencies, as well as organizations and individuals, for recreational use.

State and local bodies are being encouraged to inventory present and future recreation land needs which the Bureau of Land Management can fill, and from the public domain will come many recreational areas for the use of Americans yet unborn.

Recreational Use of Indian Lands

Like other owners of land in scenic areas away from metropolitan centers, Indian tribal groups in recent years have become increasingly aware of the attractiveness of certain reservation areas to sportsmen and tourists.

With the prospect of rapidly growing population and greater amounts of leisure time, the potentialities of recreational development of Indian lands by the Indians are tremendous.

Tribal groups which have shown keen interest in developing the recreational resources of their lands include the Eastern Cherokee Band in North Carolina, the Seminoles of Florida, and the White Mountain Apaches in Arizona.



Fishery research and stream stocking, promoted by the Department of the Interior, make this scene possible throughout the rivers, lakes, and streams of the United States.

The White Mountain Apache Tribe, for example, has on its reservation about 80 percent of the trout stream mileage in Arizona. Fishing on the reservation has been permitted under tribal license for nearly 20 years, but recently the tribe has moved toward fuller realization of the recreational potentialities of their lands.

After a comprehensive survey of recreational resources, the Tribe created a manmade lake in the mountain setting, stocked it with fish, and laid out 500 summer cottage sites for lease. This has been only one aspect of a progressive development plan on the reservation which not only increases recreational resources but adds substantial rental income from lands previously unused.

In these and other ways, the Indians of America will continue to develop the recreational resources of their reservations for their use and the use of many other Americans.

Recreation at Reservoirs

One of the major recreation attractions in the United States is water—a lake for boating, fishing, swimming, or to provide a scenic setting for a family picnic or campsite. Today the manmade reservoir lakes of the Department's Bureau of Reclamation provide our people with such wholesome outdoor enjoyment.

Recognizing the popularity of water recreation and public demand for the use of reservoirs for recreation, the Congress authorized recreation as one of the specific beneficial uses of the gigantic Upper Colorado River Storage project.

The scenic and scientific values of this area have been recognized for decades. The National Park Service, for example, reported on the entire river basin in 1941 as follows:

"The Colorado River is one of the outstanding recreational regions in the United States because of its great variety of natural scenery, climatic conditions, areas and objects of scientific interest, and abundant evidence of prehistoric occupation. . . . Here one may enjoy a large amount of sunshine and find perfect climates and settings for various types of outdoor recreation."

The Upper Colorado River project, enormous in scope and imagination, will contribute not only large amounts of water for irrigation and hydroelectric generation, but also will create a great network of manmade lakes which will provide many hours of wholesome recreation for our growing population in years to come.

Increased Use of Reservoirs

Current use of Reclamation reservoirs is mounting phenomenally. In 1955, 10 million people visited and enjoyed the water recreational

Man-made lakes in the arid west, such as Lake Mead behind the gigantic Hoover Dam, bring water sports and recreational facilities to meet the family needs of our growing population.



facilities of Reclamation reservoirs. By 1959, 19.5 million persons used these recreational resources—an increase of almost 100 percent in less than 5 years.

Coordinated planning for recreational facilities is now and will continue to be a part of each Reclamation project. Current facilities are being improved for recreational use. As the Bureau of Reclamation creates new recreational resources, administration of these areas is transferred to the Fish and Wildlife Service, the National Park Service, the Forest Service, and to State and local agencies.

Through the efforts of the Bureau of Reclamation, the highways and roads of the West carry automobiles, packed with camping equipment, followed by boat trailers to water paradises where only sand, sagebrush, and intermittently flowing streams once existed.

The Important Perspective

The American who knows his country—its scenic places and wilderness, its historic and cultural sites, its outdoors as a positive way of life—lives intimately with the timeless concepts of freedom.

All Americans, as private citizens or in collective groups either public or private, have a never-ending responsibility to themselves and their posterity to conserve and enjoy these priceless resources.

The technical responsibility for the conservation of the recreational and physical resources described on the preceding pages falls upon the Department of the Interior—an expression of the will of the people of the United States through their elected representatives.

Despite the rapid tempo of modern life and the myriad of its material comforts and benefits, the people of America are close to their history, close to their land, and close to one another. This is our heritage and the source of our material and spiritual strength.

The Department assumes a solemn trust in its resource work and approaches its responsibilities with the precept that Government is not a vehicle unto itself but a working tool to serve the best interests of all Americans today and in the years to come.

PART II

ANNUAL REPORTS OF THE
BUREAUS AND OFFICES OF THE
DEPARTMENT OF THE INTERIOR

Office of the Assistant Secretary

Water and Power Development

Fred G. Aandahl, *Assistant Secretary*



THE ASSISTANT SECRETARY for Water and Power Development discharges the duties of the Secretary of the Interior with respect to the Department's programs in the field of water and power development.

The Assistant Secretary exercises secretarial direction and supervision over the Bureau of Reclamation, Bonneville Power Administration, Southeastern Power Administration, and Southwestern Power Administration. The principal function of the latter three agencies is to market surplus power generated in their respective areas at Federal projects. The Bureau of Reclamation constructs water-use projects whose primary purpose is the reclamation of arid and semi-arid lands in the West, and also markets surplus power produced at Federal projects in the West outside the boundaries of the Bonneville Power Administration and Southwestern Power Administration and at Falcon Dam on the Rio Grande River, an international project.

The activities of the Office of Saline Water, which are more fully described in another section of this report, and the defense functions of the Secretary with respect to electric power are also the responsibility of the Assistant Secretary for Water and Power Development.

The table on the next page, prepared on a consolidated basis for fiscal year 1959, shows the capacity installed in hydroelectric power plants from which surplus power is marketed by Department of the Interior agencies, net energy generation, energy marketed, and gross revenues.

Power production and marketing data, fiscal year ended June 30, 1959

Marketing agency	Installed capacity, as of June 30, 1959 (kilowatts)	Net energy generated (million kilowatt-hours)	Energy marketed (million kilowatt-hours)	Gross revenue (thousands of dollars)
Bureau of Reclamation.....	¹ 5,902,050	27,456	⁴ 15,180	⁵ 54,213
Bonneville Power Administration.....	² 3,469,000	18,824	30,264	67,974
Southeastern Power Administration.....	² 1,259,600	2,691	⁶ 2,713	14,864
Southwestern Power Administration.....	² 601,000	1,319	⁶ 1,924	14,529
Total.....	11,231,650	50,290	50,081	151,580

¹ Includes 745,000 kilowatts in Corps of Engineers, 31,500 kilowatts in International Boundary and Water Commission, and 5,125,550 kilowatts in Bureau of Reclamation projects.

² Capacity in Corps of Engineers projects.

³ Bonneville Power Administration also markets power from Bureau of Reclamation's Grand Coulee, Hungry Horse, Chandler and Roza power plants with a capacity of 2,282,250 kilowatts. (This amount included in Bureau of Reclamation installed capacity.)

⁴ Excludes 11,324 million kilowatt-hours delivered at Grand Coulee, Hungry Horse, Chandler and Roza power plants by Bureau of Reclamation to Bonneville Power Administration. (This amount included in Bonneville Power Administration energy marketed.)

⁵ Excludes \$16,755,000 revenue received by Bureau of Reclamation from Bonneville Power Administration. (This amount included in Bonneville Power Administration gross revenue.)

⁶ Includes purchased energy.

The Assistant Secretary for Water and Power Development participated in the negotiation of contracts and agreements for the disposition of water and power from Federally constructed water-use projects. Several new and revised contracts for integration, wheeling and sale of power were approved. Details of these activities are explained in other sections of this report.

In the Southeast an analysis of the rates and charges for sale of power from the Wolf Creek, Dale Hollow, and Center Hill projects on the Cumberland River to Tennessee Valley Authority was sent to the Chairman of the Senate and House of Representatives Public Works and Appropriations Committees. In 1948 the Government made a long-term contract with the TVA to sell the power at rates based on then existing policies and practices. In 1955 the Department requested the Federal Power Commission to approve the rates and charges in the 1948 contract as amended and on May 20, 1958, the FPC issued an order disapproving the request. Surplus power produced at these projects is marketed under section 5 of the Flood Control Act of 1944.

During the fiscal year, the Department through the Assistant Secretary for Water and Power Development reviewed 64 reports of the Corps of Engineers, Department of the Army, primarily for flood control and navigation improvements; 27 Federal Power Commission applications for permits and licenses for hydroelectric developments; and one report of the Department of State on the Diablo Dam, International Boundary, Texas and Mexico.

The Assistant Secretary served as Departmental representative on the Inter-Agency Committee on Water Resources and on the President's Advisory Committee on Public Works Planning, State Department Advisory Committee on Canadian-United States Columbia

River Development, and participated in inter-agency conferences on the coordination of watershed, flood-control, and reclamation programs.

He conducted conferences in the field and in Washington on power marketing and irrigation development, attended by water and power users, Congressional delegations, and representatives of local interests and industry. Outstanding among these, were those in connection with the Missouri River Basin 1959 additional power allocations. He directed the organization of and conferred with a group of Federal and non-Federal advisors to the Secretary on the selection of processes and sites to meet the time table specified in Public Law 85-883 for saline and brackish water conversion programs.

Staff of the Office served as Departmental representatives on interagency committees concerned with radio frequency allocation, procurement of heavy electrical equipment, international water developments, the International St. Croix River Engineering Board, public works planning, financial practices for water and power projects, economic analyses, atomic energy, and allied technical subjects.

Bureau of Reclamation

Floyd E. Dominy, *Commissioner*



WATER IS THE MOST IMPORTANT single natural resource required to permit expansion of population and the economy in the 17-State semiarid western region in which the Department of the Interior's Bureau of Reclamation operates. During the fiscal year ending June 30, 1959, the Bureau of Reclamation made sound and significant progress in development of this basic resource.

During 1959, construction was completed on 3 water storage dams, with a combined storage capacity of 551,000 acre-feet; 3 diversion dams, and 410 miles of canals, pipelines, laterals and drains. Irrigation facilities were completed to serve 199,471 acres of land. Installed hydroelectric generating capacity of 45,450 kilowatts was completed. This construction activity represented an addition of about \$180 million to the Federal Government's \$3 billion investment in western projects.

Notable construction starts during the year included Paonia Dam on Colorado's Paonia project, and Stanaker Dam on the Central Utah project, first "participating" irrigation projects of the billion-dollar, five-State Colorado River Storage project. Final design was completed on initial features of the Farwell unit of the Missouri River Basin project, Nebraska, and the San Angelo project, Tex.

The Bureau of Reclamation's 79 irrigation projects serve more than 128,000 farms and embrace a total of 8,049,642 acres. A total of 6,756,737 acres was irrigated during 1958, producing crops valued at \$987,441,504. This record-breaking harvest brought the cumulative total value of crops produced in Reclamation project areas since 1906 to \$14.2 billion, nearly five times the net Federal investment in Reclamation.

Bureau projects provided 260 billion gallons of water for municipal and industrial and other nonirrigation uses in 1958. This water was delivered to 106 municipalities and 68 industrial entities in 32 project areas scattered throughout the West.

The importance of this aspect of the Reclamation program is indicated by the fact that about 8½ million persons live in the municipal and industrial entities served by the Bureau, including the large metropolitan areas of Los Angeles and San Diego. These are in addition to the 790,000 who live on irrigated homesites on the fringes of the cities and towns on Reclamation projects. Nearly a half million persons make up the farm families who reside on project farms. Thus the daily activities of nearly 10 million persons are vitally affected by Reclamation water supplies.

In addition to these direct uses of water resources developed and distributed by going Reclamation projects, a tremendous recreational resource has been created by the artificial lakes built in the semiarid West for water conservation purposes. The Bureau's reservoirs provide 1½ million acres of water surface for recreational use. Public visitations to these reservoirs tripled in the past 8 years to reach a total of nearly 19.5 million visitor days of use in 1958.

The new popularity of boating in the West was typified by region 7 of the Missouri River Basin, where, on 28 Bureau reservoirs, watercraft in use during the year totaled 55,700, with a peak-day use at Horsetooth Reservoir in Colorado of 1,150 boats.

In spite of an increase in activities, the continued utilization of carefully planned staffing control resulted in a further decline in Bureau employment during fiscal year 1959. At the beginning of the year there were 10,125 full-time employees on the rolls; at the end of the year, the figure was 9,717. Eleven project offices were established and three offices at completed projects were closed.

During the year, the Bureau, in cooperation with other agencies, was engaged in comprehensive surveys in 10 river basins throughout the West, in 12 subbasins of the Missouri River Basin, and in Alaska. A total of 134 projects were under investigation at the close of the year.

A far-reaching new loan program for local construction of small Reclamation projects and distribution systems began to hit its stride in fiscal 1959. Congress appropriated \$14,497,000 for the first six loans approved under the Small Reclamation Projects Act of 1956, and construction was initiated on four projects. Eight other applications for loans totaling \$16,032,000 had been approved by the Bureau or forwarded to Congress. Three distribution system loans also were approved.

As of June 30, the Bureau operated 41 powerplants with a total installed nameplate capacity of 5,137,550 kilowatts. In addition, the agency marketed power generated at four U.S. Army Corps of Engineers powerplants, with a capacity of 745,000 kilowatts, and one 31,500-kilowatt powerplant installed by the International Boun-

dary and Water Commission. Total sales by the Bureau aggregated 26,504,260,413 kilowatt hours, with \$70,968,412 in gross revenues.

Design improvement and research at the Bureau's Engineering Laboratories in Denver, Colo., and in the field, led to substantial achievements that will increase project efficiency, reduce water evaporation and waste, and otherwise save money and water for water users. Results of large-scale reservoir evaporation tests at Lake Hefner—part of the municipal water supply system at Oklahoma City, Okla.—were published.

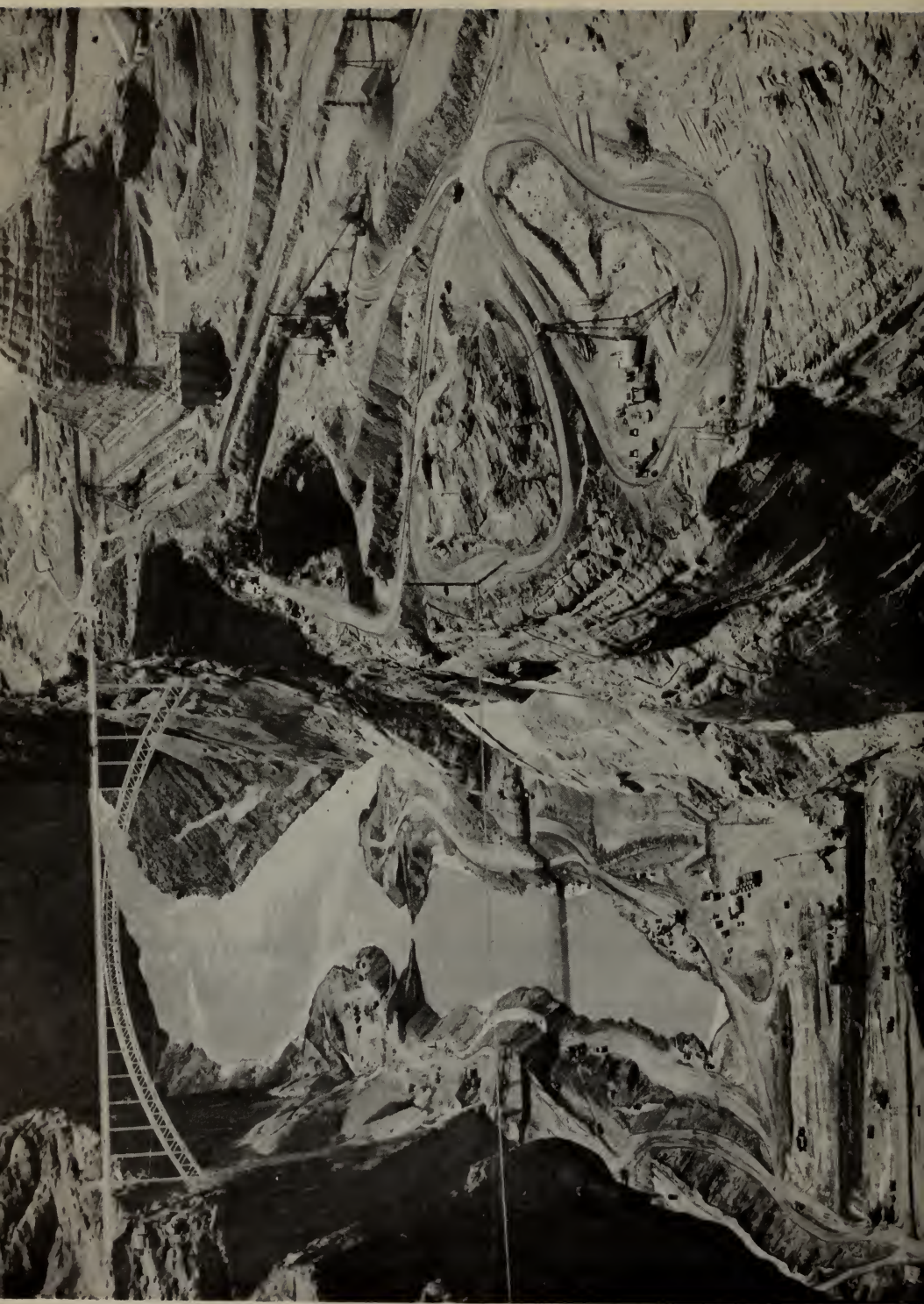
These latter studies showed that even under the unfavorable conditions which prevailed at Lake Hefner during the 1958 tests, a 9 percent reduction of evaporation loss was achieved through use of a monomolecular layer of hexadecanol (an invisible chemical layer one molecule thick) on the reservoir surface. Under ideal conditions, evaporation savings at the prevailing temperatures could have been increased fourfold.

Reclamation "know-how" was exported to assist friendly semiarid countries through the Bureau's Foreign Activities program. On-the-job training was provided to 86 technicians from 33 countries, and 215 additional individuals spent shorter periods in the Bureau's various offices. Twenty-three Bureau representatives visited 12 countries as consultants, 6 engineers were on extended advisory assignments in Taiwan and Australia, and a team of 9 initiated a reconnaissance survey of the Blue Nile River Basin in Ethiopia.

A total of 47 repayment contracts were executed with irrigation and conservancy districts for repayment of costs of Reclamation project works. This brought the total value of all Reclamation repayment contracts to \$916,073,149, of which \$140,294,832 has been repaid. Delinquencies are negligible. In addition, more than \$125 million will be returned to the Government in water service payments under contracts now in force.

A modification of the Reclamation Project Act of 1939 was enacted into law during the year. This legislation authorizes the adoption and operation of a variable repayment formula to permit variations in annual payments consistent with economic conditions, without extending the contracted repayment period.

Soil and moisture conservation work was carried out in 108 individual programs on 49 Federal irrigation projects or units. Much progress has been made in reducing costs and water losses due to weeds on irrigation systems through the Bureau's weed control program and it was estimated that such losses have been reduced \$12 million annually as compared to 1948. A total of 339 cooperative agreements with other Federal, state, and local agencies for studies on the efficient use of soil and water, recreational management, and



other problems related to the management and operation of Reclamation projects were underway at the close of the fiscal year. Roughly half of the 10 million acres of land under the Bureau's jurisdiction has been turned over to other Federal, State and local agencies for recreational administration. Eleven development farms are operated for research and demonstration purposes.

The Bureau conducted one land opening on the Columbia Basin project, making available for settlement 31 farm units embracing 3,223 irrigable acres of new land. Since the close of World War II, 62 land openings have been held on 14 projects, opening a total of 2,756 new farm units, encompassing 263,856 irrigable acres.

Formal dedication services were held to mark completion of construction of the Glendo Dam and its 24,000-kilowatt powerplant on the Missouri River Basin project in Wyoming, and of the Bureau-designed Glen Canyon highway bridge, highest steel arch (700 feet) and second longest (1,271 feet) of its type in the United States.

Dam embankment placement at a rate of more than 1 million cubic yards per month pushed construction of the country's highest earth-fill dam, the 537-foot high Trinity Dam on California's Central Valley project. Trinity Dam is about 60 percent complete. The Ventura project in California, and the Roza and Kennewick Divisions of the Yakima project in Washington were substantially completed.

This was the first year of full-scale operation for the Palisades project on the Upper Snake River, in Idaho. The usable storage capacity of 1,200,000 acre-feet was filled for the first time, 558.8 million kilowatt-hours of hydropower was generated, and the Palisades Reservoir became a favorite fishing and recreation spot.

All of the larger Bureau reservoirs are operated to achieve the maximum degree of flood control consistent with reasonably safe operation for their primary purposes. In the Northwest, for example, preliminary data indicated that storage control by Bureau reservoirs reduced peak flows on the lower Columbia River by 70,000 to 80,000 cubic-feet per second.

The impact of a regulated river on an area was well typified by the lower Colorado River. Colorado River water released during

Construction activity at site of Nation's second highest dam—Construction activities dominate this section of the Glen Canyon gorge of the Colorado River where the Bureau of Reclamation's 700-foot Glen Canyon Dam is being built to rival the 726-foot Hoover Dam farther downstream. The contractor's cofferdam construction is visible at lower left, while excavation for the spillway and erection of the concrete-mixing plant are progressing on the right rim.

the year from Lake Mead supplied domestic and industrial water to some 6 million people in the Pacific Southwest, irrigated more than a million acres of land in this country and Mexico, to produce crops valued at \$239.7 million on the U.S. acreage alone, and generated nearly 6 billion kilowatt-hours of energy—roughly 15 percent of the electrical energy consumed in the Pacific Southwest. And this was accomplished in spite of the fact that inflow to Lake Mead above Hoover Dam during the year was only about 54 percent of the 36-year (1923–58) average.

Three major contracts, totaling approximately \$3½ million were awarded for manufacturing of the last major generating unit in the Hoover powerplant. Scheduled for operation in 1961, the 95,000-kilowatt unit will complete the Hoover powerplant, raising it to its full capacity of 1,344,800 kilowatts.

Preliminary studies of the transmission system required for the Colorado River Storage project indicated the possibility of using extra-high-voltage transmission. A tentative report on a 345-kilovolt backbone transmission system, showing the results of these preliminary studies, was prepared for initiating discussion with potential customers. The heaviest line in Bureau transmission systems is 230 kilovolts.

When the flow of the mighty Colorado River was first diverted in the 1930's to construct Hoover Dam, the closure of the diversion dam made headlines throughout the world. The river was diverted again by the Bureau on February 13, 1959, when closure of the upstream cofferdam was effected at the Glen Canyon area and the full flow of the river was diverted through the right diversion tunnel. The scant attention this incident received in the press indicates that diversions of mighty rivers have become commonplace.

Construction of the 4,500-kilowatt Big Thompson Powerplant and switchyard in Colorado, initiated in fiscal 1957, was completed in June 1959. This marked completion of the Colorado-Big Thompson project, started in 1938.

Design and Construction

The scope of the year's achievement in construction is indicated by the completion of irrigation facilities to serve 199,471 acres of land and installation of 45,450 kilowatts of hydroelectric generating capacity. Construction was completed on 3 storage dams which have a combined capacity of 551,000 acre-feet, 3 diversion dams, and 410 miles of canals, pipelines, laterals, and drains.

Awarded during the fiscal year period were 465 construction, material, equipment, and supply contracts. The total value of these con-

tracts was about \$72 million. Contracts for construction totaled about \$62 million, or about 86 percent. The 145 construction contracts in progress at the end of the fiscal year had a total face value of about \$345 million.

On the Columbia Basin project in Washington, irrigation facilities were completed to serve an additional 34,000 acres, bringing the total to 385,000 acres. Completed was the 15-foot-diameter, 3-mile long Wahluke Siphon. Also completed were 62 miles of laterals, including 8 pumping plants, on the Wahluke Branch Canal and the 10-mile Esquatzel Diversion Canal. In the same State, the 11,250-kilowatt capacity Roza Powerplant on the Yakima project began commercial operation.

Construction progress in Oregon was highlighted by completion of the earth and rock-fill Howard Prairie Dam on the Rogue River Basin project and the Soda Creek Diversion Dam. Completed also were 15 miles of delivery canal and collection canals. Virtually completed at the end of the fiscal year were the 16,000-kilowatt Green Springs Powerplant and Power Conduit. The earthfill Keene Creek Dam neared completion. Work was begun on enlargement of Emigrant Dam, a thin concrete arch structure built about 35 years ago.

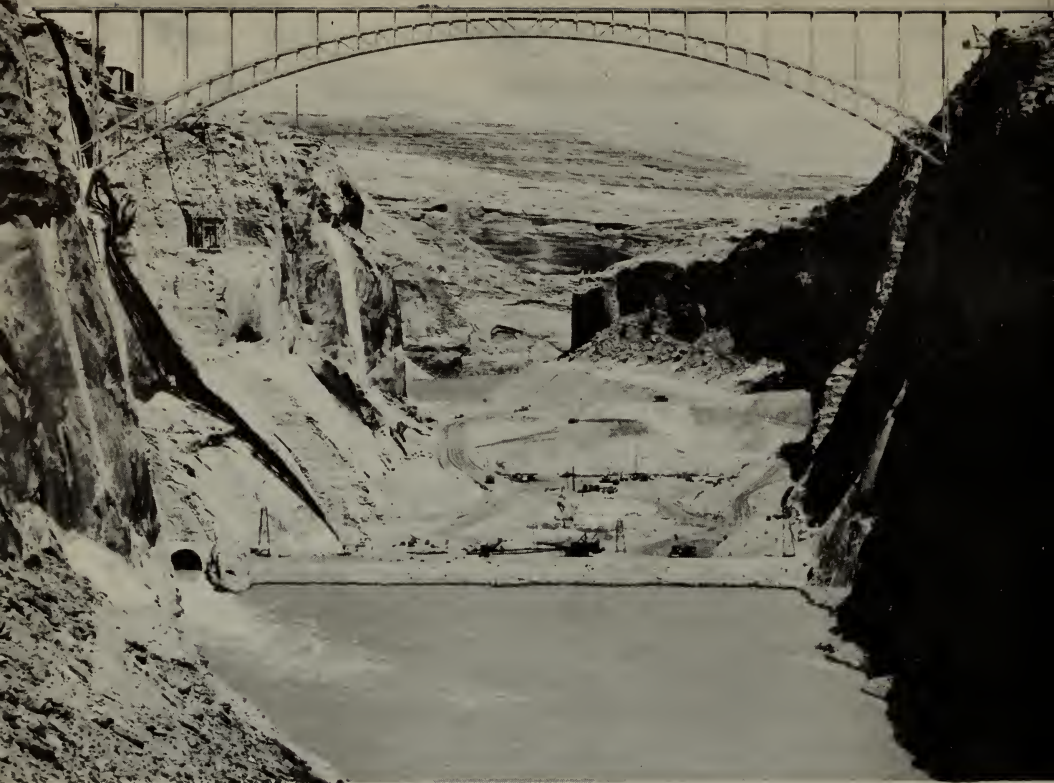
Elsewhere in Oregon, construction began on the earthfill Prineville Dam on the Crooked River project, now about 35 percent completed. Construction of Wasco Dam, an earthfill structure on the Wapinitia Project reached the midway point.

Progress on Trinity Dam

By the end of the year, some 12 million cubic yards of the 33-million cubic yard embankment required for 537-foot high Trinity Dam in California had been placed. Excavation and concrete lining of the 10.8-mile-long, 17.5-foot-diameter Clear Creek Tunnel, second longest tunnel on a Bureau of Reclamation project, was about 55 percent completed. The dam and tunnel will ultimately make possible the project's average annual transbasin diversion of 865,000 acre-feet of surplus waters from the Trinity River watershed to the Central Valley Basin.

Also in California, Twitchell Dam, an earthfill structure on the Santa Maria Project, was completed, as was the earthfill Casitas Dam on the Ventura River project. Also completed on the latter project were the Robles Diversion Dam, Robles-Casitas Diversion Canal, and 33 miles of distribution system pipelines.

Construction progress on the 700-foot high Glen Canyon Dam, principal feature of the Colorado River Storage project, in northern Arizona, was marked by completion of the two 41-foot, 1½-mile long



World's highest steel-arch bridge frames dam construction scene—This 700-foot high steel-arch bridge, spanning the Colorado River above the Glen Canyon Dam construction site, was opened to traffic in February, 1959. Before completion of the Bureau of Reclamation-designed bridge, it was 200 miles from rim to rim by existing roads and a crossing at Marble Canyon downstream. Outlet of one of the two large diversion tunnels is shown lower left. Earth- and rock-fill cofferdams upstream and downstream of the damsite permit unwatering of the foundation.

diversion tunnels which will carry the entire flow of the Colorado River around the dam site throughout the construction period. Also virtually completed was the excavation of the right and left abutment keyways for the ends of the concrete arch dam. Earthfill cofferdams were constructed upstream and downstream from the dam site to isolate the construction area from encroachment by the river, which was successfully diverted from its channel in February 1959. Excavation of foundation for the dam was about 50 feet below the original stream bed by the end of the year. First concrete for the dam, which will have a volume of more than 5 million cubic yards, is expected to be placed in the dam in 1960. The contract

for construction of the dam and the 900,000-kilowatt Glen Canyon Powerplant is now about 27 percent completed.

New Arizona Community

Also completed on the Glen Canyon Unit were 200 residences, an administration building, fire station, and police building for the new community of Page, Ariz., near the damsite. Completed also were the community's streets and water supply and sewerage systems.



Scaling operations at rugged Flaming Gorge Damsite—Construction workers scale off loose dirt and rock from the sheer walls of the Flaming Gorge Damsite near the Utah-Wyoming border. The contractor's construction bridge across the Green River at lower left carries a concrete pipeline used in conveying concrete for lining of the diversion tunnel. The 495-foot arch-type concrete dam and 91-mile-long Flaming Gorge reservoir will be a major storage unit of the Colorado River Storage project.

During the year, construction of access roads to the Flaming Gorge dam site on the Green River in northeastern Utah was in progress. Excavation of the diversion tunnel was completed in April 1959, and diversion of the river is expected to be made early in the fall of 1959. Construction was completed on 50 residences and streets at Dutch John, Utah, the new Government community near the dam site.

The 1,425-kilowatt Wanship Powerplant and the 4,500-kilowatt Gateway Powerplant on the Weber Basin project in Utah were completed and placed in commercial operation during the fiscal year. Also completed were the project's West Farmington and Woods cross trunkline pipelines of the Davis Aqueduct and 20 miles of the Uintah Bench laterals of the Weber Aqueduct. Essentially completed was the first stage of the earth-fill Willard Dam, which will create a fresh water reservoir along the east shore of Great Salt Lake.

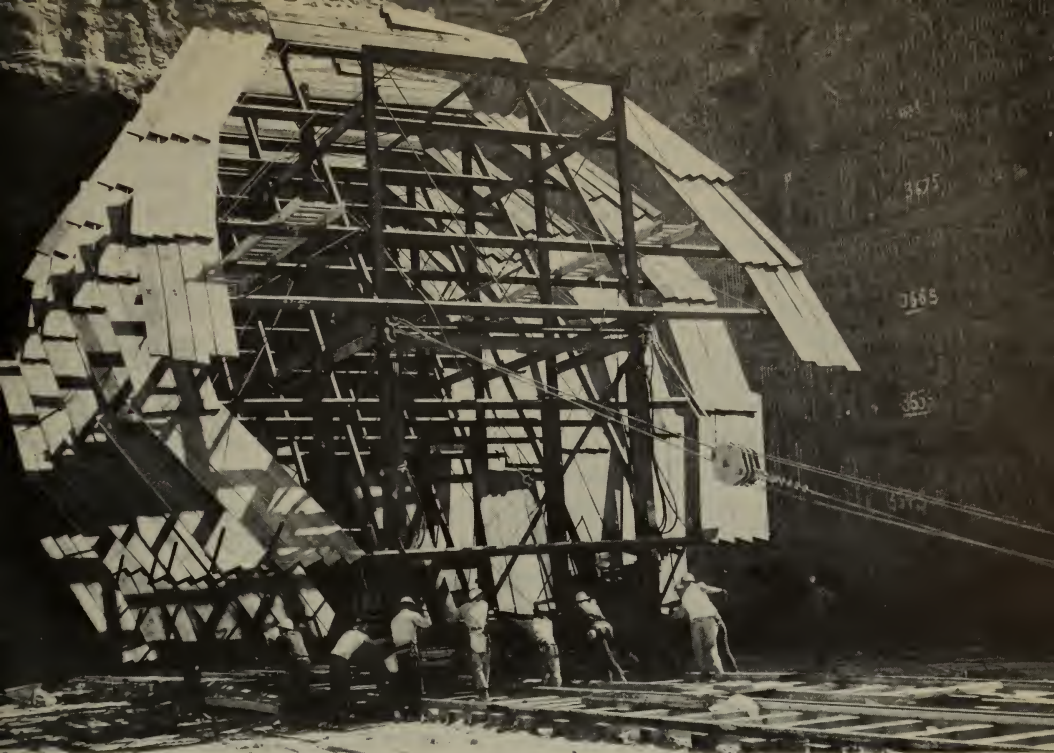
In western Colorado, construction of the earthfill Vega Dam on the Collbran project was virtually completed, and the Southside Tunnel was about one-third finished. Construction of a 21-mile long section of the Southside Canal and of the Upper and Lower Molina Powerplants (8,400 kilowatts and 4,600 kilowatts, respectively) and the 5½-mile long Bonham-Cottonwood pipeline was initiated last spring.

Work Begun on Navajo Dam

A significant undertaking in New Mexico was start of construction of Navajo Dam, a principal storage feature of the Colorado River Storage project. This large earthfill dam on the San Juan River, will have a height of 408 feet and a volume of 26 million cubic yards. By June 30 construction was about 30 percent completed.

On the Washita Basin project in Oklahoma, construction of the earthfill Fort Cobb Dam also was several months ahead of schedule and is expected to be completed early in the next fiscal year. The 21-mile long Anadarko Aqueduct was started in May. Construction of the Foss Dam, was about 35 percent completed with about 2½ million of the required 11 million cubic yards of earthfill in place.

On the Glendo unit of the Missouri River Basin project in Wyoming, construction of the 48,000-kilowatt Fremont Canyon Powerplant, and the 3-mile-long, 18-foot-diameter power conduit advanced to about 85 percent of completion. The conduit was "holed through" in December 1958, and placement of concrete lining was begun. Also in Wyoming, construction of the 203-foot-high, concrete-arch Anchor Dam on the Owl Creek Unit of the Missouri River Basin project was about two-thirds ready.



Reclamation builds Paul Bunyan-sized tunnels. *Top:* workmen at Glen Canyon Dam start a huge "jumbo," or working platform for tunnel excavation toward mouth of left spillway tunnel, which will range from 50 feet in diameter near inlet to 41 feet in diameter at the outlet. *Bottom:* construction advances on 18-foot-9-inch diameter outlet tunnel at Navajo Dam, a 395-foot earthfill structure on the San Juan River in New Mexico. Both are units of the Colorado River Storage project.



The Helena Valley Unit of the Missouri River Basin project in Montana noted completion of the 2.6-mile long, 7-foot-diameter Helena Valley Tunnel and the Helena Valley Pumping Plant. Completed also were 37 miles of the Helena Valley Canal and laterals.

On the Missouri River Basin's Bostwick Division in Kansas, 45 miles of the Courtland West Canal and laterals were completed, and construction of 5.5 miles of the White Rock Canal was about 80 percent completed. Also in Kansas, on the Kirwin Unit, the Woodston Diversion Dam and a 6-mile long section of the Osborne Canal were finished. Work was started on a 14-mile-long section of the canal together with laterals and small pumping plants.

In Nebraska, progress on the Frenchman-Cambridge Division included completion of 28 miles of the Driftwood West Canal, laterals, sublaterals, wasteways and drains, and 22 miles of the Driftwood Canal, subcanal, laterals, and drains. Rehabilitation of the Culbertson Canal Diversion Dam and reconstruction of the first 6 miles of the old Culbertson Canal was finished and reconstruction of an additional 14 miles of the canal was initiated.

The Transmission Division of the Missouri River Basin project was advanced to 85 percent of completion by the construction of footings and towers for the 165-mile, 230-kilovolt steel tower transmission line between Fargo, N. Dak., and Granite Falls, Minn. Completed was the 67-mile, 230-kilovolt Utica Junction-Sioux Falls transmission line in South Dakota. Work reached the midway point of completion on the 310-mile, 230-kilovolt steel tower transmission line which extends from the Fort Peck Powerplant in Montana to Bismarck, N. Dak. Construction started late in the fiscal year on the 37-mile, 115-kilovolt transmission line from the Boysen Powerplant to Pilot Butte Powerplant in Wyoming.

Emphasis on Safety Program

The Bureau continued to emphasize its safety program aimed at prevention of personal injuries through use of modern safety practices and other preventive measures against construction hazards. Significant progress was made by reducing the accident frequency rate 7 percent below last year's level. The overall frequency rate was kept well below average for heavy construction, despite the fact that high hazard tunnel work accounted for more than 12 percent of the total man-hours worked.

Major construction and supply contracts (more than \$1,000,000 each) awarded by the Bureau are listed in table 1.

Principal features completed on Bureau of Reclamation projects are shown in table 2.

TABLE 1.—*Major Bureau of Reclamation contracts awarded in fiscal year 1959*

Feature	Project	Amount of award
Foss Dam.....	Washita Basin.....	\$7,351,557
Willard Dam, second stage.....	Weber Basin.....	4,606,260
Penstocks and outlet pipes for Glen Canyon Dam.....	Colorado River Storage.....	3,778,000
Paonia Dam and relocation of 4.4 miles of State highway.....	Paonia.....	3,167,175
Prineville Dam.....	Crooked River.....	2,614,943
Upper and Lower Molina Powerplants, Penstocks, and Equalizing Reservoir.....	Collbran.....	2,425,247
Clearing Flaming Gorge Reservoir, first phase.....	Colorado River Storage.....	2,385,000
Bonham and Cottonwood Pipelines.....	Collbran.....	1,669,358
Stanaker Dam.....	Central Utah.....	1,658,833
Generator for Unit N-8, Hoover Powerplant.....	Boulder Canyon.....	1,601,200
15 miles of Southside Canal.....	Collbran.....	1,598,349
Stringing conductors and overhead ground wires for 165-mile Fargo-Granite Falls 230-kilovolt transmission line.....	Missouri River Basin.....	1,524,647
Kortes-Cheyenne 115-kilovolt transmission line, 140 miles.....	do.....	1,513,367
Foundations and steel towers for 100 miles of Bismarck-Jamestown 230-kilovolt transmission line.....	do.....	1,447,700
13.9 miles of Osborne Canal and 17 miles of laterals and drains.....	do.....	1,434,548
Hydraulic turbine for Unit N. 8, Hoover Powerplant.....	Boulder Canyon.....	1,422,800
20.9 miles of Anadarko Aqueduct.....	Washita Basin.....	1,372,551
Relocation of 5.5 miles of Trinity County Road.....	Central Valley.....	1,321,341
48.8 miles of North and East Side Laterals and 18.1 miles of drains.....	Missouri River Basin.....	1,242,448
56 miles of Block 82 laterals, wasteways, and drains.....	Columbia Basin.....	1,215,273
Increasing height of Little Wood River Dam.....	Little Wood River.....	1,093,945

TABLE 2.—*Principal features completed on Bureau of Reclamation projects in fiscal year 1959*

Feature	Project	State
Wahluke Siphon.....	Columbia Basin.....	Washington.
87 miles canals, laterals, wasteways, and drains.....	do.....	Do.
Howard Prairie Dam.....	Rogue River.....	Oregon.
15 miles of delivery canal and collection canals.....	do.....	Do.
Soda Creek Diversion Dam.....	do.....	Do.
Roza Powerplant.....	Yakima.....	Washington.
12 miles of pipelines for Southern San Joaquin Municipal Utility District.....	Central Valley.....	California.
Twitchell Dam.....	Santa Maria.....	Do.
28 miles of Putah South Canal.....	Solano.....	Do.
Casitas Dam.....	Ventura.....	Do.
Robles Diversion Dam.....	do.....	Do.
4 miles Robles-Casitas Diversion Canal.....	do.....	Do.
33 miles Ventura distribution system pipelines.....	do.....	Do.
5 steel water tanks.....	do.....	Do.
Community facilities for Flaming Gorge Dam.....	Colorado River Storage.....	Utah.
Colorado River Bridge.....	do.....	Arizona.
200 residences for Page, Ariz.....	do.....	Do.
Water supply system for Page, Ariz.....	do.....	Do.
20 miles of Uintah Bench pipe laterals.....	Weber Basin.....	Utah.
Wanship and Gateway Powerplants.....	do.....	Do.
4 miles pipeline for Davis Aqueduct trunklines.....	do.....	Do.
40 miles Farson—West Side laterals and drains.....	Eden.....	Wyoming.
22 miles channelization of Rio Grande.....	Middle Rio Grande.....	New Mexico.
Helena Valley Tunnel.....	Missouri River Basin.....	Montana.
Helena Valley Pumping Plant.....	do.....	Do.
37 miles of Helena Valley Canal and laterals.....	do.....	Do.
67-mile Utica Junction-Sioux Falls 230-kilovolt transmission line.....	do.....	South Dakota.
Big Thompson Powerplant.....	Colorado-Big Thompson.....	Colorado.
45 miles of Courtland West Canal and laterals.....	Missouri River Basin.....	Kansas.
72 miles of Driftwood and Meeker Extension canals.....	do.....	Nebraska.
7 miles of Culbertson Canal laterals, and drains.....	do.....	Do.
Glendo Powerplant.....	do.....	Wyoming.
Woodston Diversion Dam.....	do.....	Kansas.
6 miles Osborne Canal.....	do.....	Do.

Design and Research Progress

Increased emphasis was given during the year to utilizing automatic computing devices in design work. A comprehensive program was developed to utilize an electronic computer in determining canal and earthwork quantities and related information. Such machine processing of data led to considerable savings in time and effort in computing required quantities. Electronic computer techniques were also developed to solve a variety of technical problems in studying operations of multiple-purpose hydrology systems, determining total sediment load in streams, determining temperatures in concrete dams, and reducing field data from tests on large hydraulic and electrical machines.

Design developments led to the method of disposing of high sediment loads in the Peralta Main Canal of the Middle Rio Grande project in New Mexico through use of a hydraulic dredge. The dredge will operate in a settling basin which is to be constructed near the canal headworks at the Isleta Diversion Dam on the Rio Grande. The dredge will have an operating capacity of 110 cubic yards an hour. Sediment dredged from the settling basin will be discharged at selected spoil areas along the bank of the Rio Grande.

Other design innovations developed during the year included a new stoplog design for stopping the flow of water through the diversion tunnel at Flaming Gorge Dam. Outlet gates, 7 feet wide by 10.5 feet high, for heads up to 350 feet (highest head gates of this size and type to be designed by the Bureau), were designed to regulate discharges through the left diversion tunnel at Glen Canyon Dam. A new method of counterweight suspension was developed for the spillway gates at Glen Canyon Dam, which will make possible appreciable savings in construction costs.

Designs were completed during the year and construction began on the earthfill Sheep Creek Barrier Dam in the Paria River Basin in Utah, the first dam to be undertaken by the Bureau of Reclamation for the sole purpose of retaining sediment. The Paria River Basin was formerly a fertile meadow, but because of extensive over-grazing during the early 1900's and damaging floods it became an unproductive, badly eroded area. Design and construction of the dam is part of a cooperative program of various Federal and State agencies to demonstrate that by building suitable structures and by proper soil and moisture conservation practices, the basin lands can revert to former productivity.

Electrical Logging Trails Held

The first full-scale field trials of electrical logging to detect possible leakage from operating canals were made on the Central Valley project in October 1958. The method is an adaptation of drill hole

logging which has widespread application in the oil industry. Electrical logging permits a continuous measurement and recording on a chart of variations of the electrical resistance of materials making up the bottom and/or banks of a canal. Logging has shown that water lowers the resistance of earth materials, and in those reaches of a canal where the resistance is low, leakage may be suspected. Identifying such reaches permits subsequent verification of the leakage and remedial measures as necessary.

Research in the Bureau's Denver engineering laboratories led to the first large-scale use of heavy media processing of concrete aggregates at Glen Canyon and Flaming Gorge Dams. Nearby aggregates at both sites contain soft, absorptive, lightweight particles that would produce poor quality concrete. The heavy media separation process removes the undesirable lightweight material from the aggregate by introducing the aggregate into a "heavy liquid" having a specific gravity between the specific gravities of desirable and objectionable aggregates. The light objectionable materials float to the surface and are carried off as waste products; the desirable aggregate sinks in the medium and is recovered for use in concrete.

Substantial progress was made in laboratory and field experiments with water-reducing retarding agents for concrete. The benefits from use of such agents include increased workability and reduction in cement content. For some concrete, particularly that pumped for tunnel lining, the agents have further advantage in permitting the concrete to remain plastic for an extended period. One of these agents was used in the concrete of the Glen Canyon Dam diversion tunnels.

New Techniques in Hydraulic Research

In hydraulic research, new techniques were developed to dissipate the energy contained in jets issuing from controls in high head outlets. Data were derived in the Hydraulic Laboratory for revised discharge tables for the constant head orifice turnout originally developed by the Bureau.

Aquatic weed control investigations, which have been conducted at the Denver laboratories for a number of years in collaboration with the Agricultural Research Service, were significantly expanded by the initiation of a series of investigations in California aimed specifically at developing economic and effective means of controlling aquatic weeds in large canals conveying up to 5,000 cubic feet per second. A laboratory method was developed for the evaluation of emulsifying agents for aromatic solvent water-weed killer, which would result in a savings of about 25 percent in the use of emulsifiers.

A contraction joint simulator, devised in the laboratories, represents a significant advance in test methods for joint sealing materials



This water-stealing plant "wanted" by western authorities—This thriving velvet mesquite, photographed on the banks of Arizona's Gila River, is a phreatophyte, one of many water-stealing plants which invade canals and reservoir areas in western states. It is estimated that phreatophytes infest more than 15 million acres in the 17 western states and that they transpire at least 25 million acre feet of water annually—almost enough to fill Lake Mead. The Bureau of Reclamation directs research and control measures against these plant pests.

proposed for use in concrete structures such as powerhouses and irrigation canals. The contraction joint simulator tests the materials under conditions closely approximating the field service but at an accelerated rate, thus permitting quick and accurate evaluation in advance of use.

Cooperative studies of the water consumption by salt cedar (*tamarisk*) conducted by the Bureau of Reclamation and the Department's Geological Survey continued at a 10-acre site near Buckeye, Ariz. The studies are expected to be significant not only in the control of the objectional phreatophyte (water stealing) plants which infest large areas of certain river basins in the Southwest, but also in the development of techniques to study the water consumption of beneficial crops raised on irrigated projects. The studies utilize six lysimeters, 33-foot square by 10-foot deep tanks placed in the ground

and in which salt cedar plants have been transplanted for observation of growth with water levels maintained at different depths.

During the year, 113 laboratory reports were issued covering hydraulic laboratory investigations, structural studies, research in weed control, dimineralization of saline water, and water evaporation, and research and testing of concrete and concrete materials, earth and bituminous materials, and protective coatings.

Foreign manufacturers' interest in Bureau of Reclamation equipment advertisements continued. A total of 18 contracts, principally for electrical equipment, was awarded to companies offering equipment manufactured outside the United States. This compares with 21 contracts awarded to foreign manufacturers in fiscal year 1958, and 26 in 1957. The 1959 contracts, which totaled \$899,076, were awarded to 6 Swiss, 5 English, 3 West German, 2 Austrian, 1 French, and 1 Italian firm. The required differential was added to foreign bids for comparison with domestic bids.

Construction Costs Increase

Construction costs on Bureau of Reclamation projects increased about 21½ percent during the year. Most of this increase occurred during the first half of the year. For the same period, construction wage rates and costs of materials increased from 3 to 5 percent.

Bidding interest in Reclamation construction work was more than 20 percent higher than the average for the past 10 years, and about 15 percent higher than the average for last year. An average of 7.6 bids per construction schedule was received. The average low bid was 13 percent under the Bureau's engineers' estimates for all construction schedules advertised.

Table 3 shows cost indexes for Bureau of Reclamation construction work based on the combined costs of materials and labor supplied by the contractor, and materials and labor supplied by the Government.

Technical Records Published

Published during the year were the technical records on the design and construction of Monticello Dam and the Potholes East Canal. Also published were two engineering monographs, describing, respectively, the structural behavior of Hungry Horse Dam and the hydraulic design of stilling basins and bucket energy dissipators. Completed and scheduled for issuance early in fiscal year 1960 were technical records on the design and construction of the Cachuma Dam, Tecolote Tunnel, Delta-Mendota Canal, and the Tracy Pumping Plant.

TABLE 3.—*Bureau of Reclamation construction indexes, fiscal year 1959*

Cost indexes based on January 1940 costs=1.00	July 1958	January 1959	June 1959
Dams:			
Earth.....	2.20	2.24	2.24
Concrete.....	2.36	2.38	2.38
Pumping plants:			
Building and equipment.....	2.93	3.03	3.03
Structures and improvements ¹	3.05	3.07	3.07
Equipment.....	2.90	2.99	3.00
Pumps and prime movers.....	3.02	3.11	3.15
Accessory electric and miscellaneous equipment.....	2.70	2.79	2.79
Steel penstocks and discharge pipes.....	3.55	3.75	3.79
Canals and conduits:			
Canals.....	2.44	2.44	2.42
Conduits (tunnels, free-flow, concrete-lined).....	2.89	2.92	2.89
Laterals and drains.....	3.07	3.19	3.15
Powerplants, hydro:			
Building and equipment.....	2.85	2.99	2.99
Structures and improvements ¹	3.03	3.06	3.06
Equipment.....	2.89	2.95	2.96
Turbines and generators.....	2.88	2.95	2.99
Accessory electrical equipment.....	2.74	2.80	2.80
Miscellaneous equipment.....	2.73	2.81	2.83
Concrete pipelines.....	2.42	2.43	2.47
Transmission switchyards and substations.....	2.89	2.98	3.00
Transmission lines (wood-pole 115-kilovolt).....	2.44	2.48	2.44
Transmission lines (steel tower 230-kilovolt).....	2.67	2.75	2.75
Permanent general property:			
Buildings.....	2.98	3.05	3.07
Roads and bridges:			
Primary roads.....	2.52	2.58	2.60
Secondary roads, unsurfaced.....	2.34	2.36	2.38
Bridges (steel).....	3.14	3.23	3.23
Composite index.....	2.63	2.71	2.69

¹ Indexes for structures and improvements on pumping plants and powerplants are based on a reinforced concrete structure.

Water Use and Land Utilization

The irrigation systems of Reclamation projects embrace 8,049,642 acres of land in the 17 Western States. The 79 irrigation projects serve more than 128,000 farms. These fertile, well-watered farmlands stand out in sharp contrast with the adjacent dryland areas. They provide a feed base which plays the key role in stabilizing the rangeland livestock economy. They provide for the distant areas of the Nation, as well as for the West itself, large quantities of fruits and vegetables, which provide nutritious diversity to the American diet. These project areas are important hubs of trade and commerce throughout the 17-state Reclamation West, and the livelihoods and investments of a sizeable share of the population of that area are influenced by irrigation farming and its associated enterprises.

Irrigation Service

The acreage irrigated on Reclamation projects increased 199,471 acres in 1958. This brought to 6,756,737 the total acreage irrigated. Irrigation service was initiated in 1958 on the Chief Joseph Dam project and the Michaud Flats project. Supplemental water service was made available on the Glendo Unit of the Missouri River Basin project.

POPULATION GROWTH IN RECLAMATION STATES

from 41 million in 1957 to

60 million in 1975

PACIFIC COAST
STATES UP 64%

MOUNTAIN
STATES UP 43%

PLAINS
STATES
UP 29%

130 million in 2010

PACIFIC
COAST
UP 310%

MOUNTAIN
STATES UP 217%

PLAINS
STATES
UP 115%

TOTAL U.S. IN | 1975-230 million (up 35%)
| 2010-370 million (up 118%)

Based on Dept. of Commerce data

Reclamation provides water for the nation's fastest growing area—Water developed by Bureau of Reclamation facilities has been a major factor in making possible the tremendous postwar population and industrial growth in the West. This table shows that this area is maintaining its rapid rate of growth making additional development of the area's key resource—fresh water—a continuing, high priority requirement.

Full irrigation service, wherein the complete water supply is provided through works constructed or rehabilitated by the Bureau, was provided to 3,407,057 acres. A supplemental water supply was furnished to 3,254,388 acres. Temporary water service arrangements covered 95,292 acres of irrigated land.



Reclamation orchards create oases in semiarid Southwest—Acreage on Reclamation projects planted to fruit and nut trees increased 18 per cent between 1954 and 1958. Total production of fruit and nut crops now exceeds 2 million tons annually. These thriving citrus and avocado orchards are in the Ojai Valley of California's Ventura River project.

Crop Production

The total value of all crops grown on Reclamation projects in 1958 was \$987,441,504 bringing the cumulative total since the initiation of the Federal Reclamation program to \$14.2 billion. (See Table 4.) This aggregate value is almost 5 times the net investment

TABLE 4.—*Acreage and gross crop value, 1958*

Crop group	Irrigated crops		Gross crop value	
	Acres	Percent of total	Dollars	Percent of total
Cereals.....	1,756,021	25.99	\$110,841,789	11.22
Forage.....	3,019,481	44.69	161,267,551	16.33
Miscellaneous field crops.....	1,267,618	18.76	318,754,604	32.28
Vegetables.....	489,346	7.24	165,001,932	16.71
Seeds.....	233,864	3.46	28,296,059	2.87
Fruits, nuts and miscellaneous.....	324,992	4.81	176,371,741	17.86
Other ¹			26,907,828	2.73
Total reported.....	7,091,322	104.95		
Less: Multiple cropped.....	480,426	7.11		
Plus:				
Soil building crops.....	27,264	.40		
Cropland not harvested.....	118,577	1.76		
Total.....	6,756,737	100.00	987,441,504	100.00

¹ Additional revenues from Federal and commercial agencies.

of the U. S. Government in Reclamation project facilities, which serve not only irrigation but also the associated functions of flood control, hydroelectric power, municipal and industrial water, river regulation for pollution abatement, fish and wildlife, and other purposes.

The crop value in 1958 was nearly \$60 million greater than for the previous year and exceeded the previous record year of 1952 by \$22 million. The per-acre value averaged \$146.14, but ranged up to \$681.70 per acre on a total project basis. (See Table 5.) The highest average per-acre value for a single crop was \$1,620 for celery. Other specialty crops averaging more than \$1,000 per acre were cucumbers, green onions peppers, and dates.

Water for the semiarid West—Bureau of Reclamation storage dams impound spring flood waters and surplus runoff of western streams for release for multiple-purpose use when natural stream flow has been reduced or dried up entirely. Some large storage reservoirs like Hoover Dam's Lake Mead and the Glen Canyon Dam and Reservoir, now under construction, will store water many years for use in prolonged dry periods. This is a view of Canyon Ferry Dam and Reservoir in Montana, a major unit of the multiple-purpose Missouri River Basin Project.

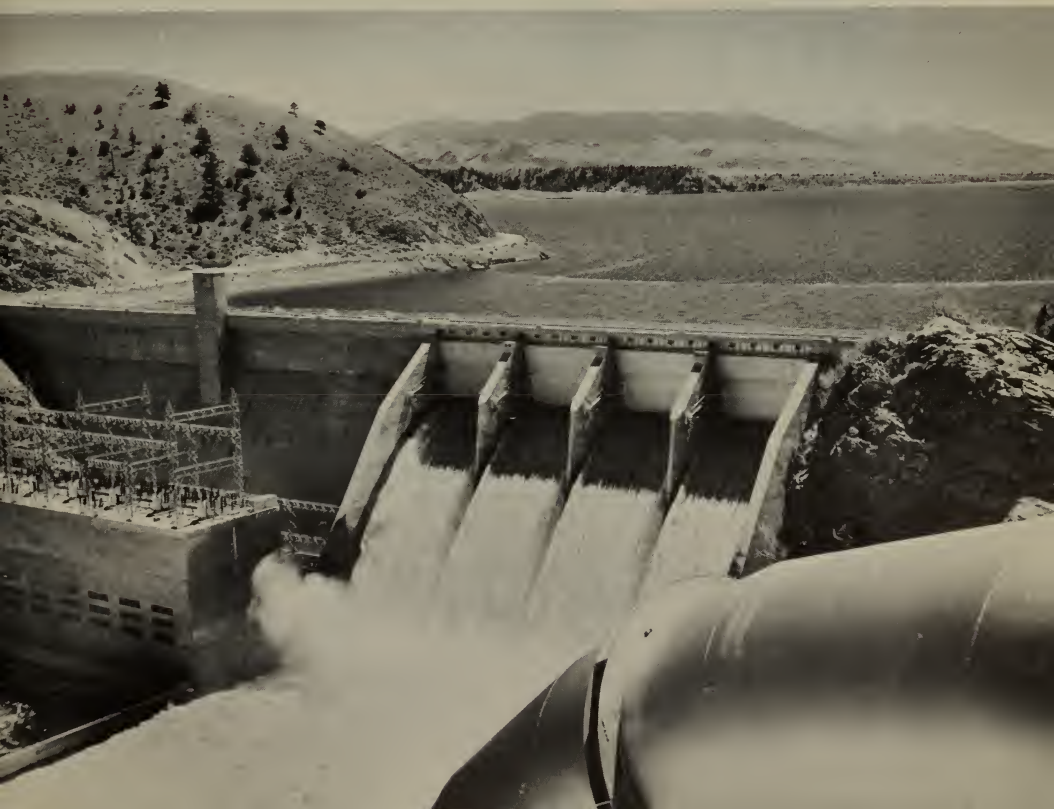


TABLE 5.—*Irrigation and gross crop value data by type of irrigation service for each State, 1958*

State	Project and division	Full irrigation service		Supplemental irrigation Service		Temporary irrigation Service		Total	
		Irrigated area	Gross crop value	Irrigated area	Gross crop value	Irrigated area	Gross crop value	Total	Average per acre irrigated
Arizona	Gila	<i>Acres</i>	<i>Dollars</i>	<i>Acres</i>	<i>Dollars</i>	<i>Acres</i>	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
	Salt River	67,722	10,982,425				67,722	10,982,425	162.17
	Yuma (see also California)	163,259	52,145,374				229,822	70,414,997	306.39
	Yuma Auxiliary	45,250	19,636,826	66,563	18,269,623		45,250	19,636,826	433.96
		2,892	1,253,265				2,892	1,253,265	433.36
California	Subtotal	279,123	84,017,890	66,563	18,269,623		345,686	102,287,513	295.90
	Boulder Canyon	547,918	135,939,297				547,918	135,939,297	248.10
	Cachuma	61		12,519	8,575,727		12,580	8,575,727	681.70
	Central Valley	30,033	8,803,172	639,216	193,698,647	90,860	709,089	229,871,751	290.58
	Klamath (see also Oregon)	77,211	8,165,830				77,211	8,165,830	105.76
Colorado	Orland	17,376	1,172,572				17,376	1,172,572	67.48
	Yuma (see also Arizona)	9,102	1,540,930				9,102	1,540,930	169.30
	Subtotal	681,701	155,621,801	651,735	202,234,374	90,860	1,424,296	376,266,107	264.18
	Colorado-Big Thompson			720,000	71,295,565		720,000	71,295,565	99.02
	Fruitgrowers Dam			2,042	180,639		2,042	180,639	88.46
	Grand Valley	28,161	2,733,628	7,353	1,975,653		35,514	4,709,281	132.60
	Mancos			7,057	312,335		7,057	312,335	44.26
	Missouri River Basin								
	Upper Republican Division: St. Francis Unit.			384	10,842		384	10,842	28.23
	Paoia								
	Pine River (see also New Mexico)			9,002	866,488		9,002	866,488	96.26
	Pine River Indian Irrigation			33,546	1,192,703		33,546	1,192,703	35.55
	Uncompangre	63,070	4,682,442	9,613	348,019		9,613	348,019	36.20
	Subtotal	91,231	7,416,070	788,997	76,182,244		63,070	4,682,442	74.24
							880,228	83,598,314	94.97

Idaho.....	Avondale.....	509	25,744	124,463	13,489,245	423	9,253	1,430,921	130,359,818	50,58
	Boise (see also Oregon)	201,991	20,852,406	---	---	---	---	326,559	25,454	34,341,651
	Dalton Gardens.....	594	34,343	---	---	---	---	594	34,343	105,20
	Lewiston Orchards.....	2,022	383,099	---	---	---	---	2,022	383,099	57,82
	Minchaud Flats.....	4,442	521,037	---	---	---	---	4,442	521,037	189,47
	Minidoka.....	184,520	17,898,881	873,024	72,409,449	423	9,253	1,057,967	90,317,583	117,30
	Owyhee (see also Oregon)	31,397	4,047,526	---	---	---	---	31,397	4,047,526	85,37
	Preston Bench.....	3,671	332,391	3,865	356,444	---	---	3,865	356,444	128,91
	Rathdrum Prairie.....	---	---	---	---	---	---	3,671	332,391	92,22
	Subtotal.....	429,146	44,095,427	1,001,352	86,255,138	423	9,253	1,430,921	130,359,818	9,10
Kansas.....	Missouri River Basin:	8,707	685,462	---	---	---	---	8,707	685,462	78,73
	Bostwick Division: Courtland unit.....	4,127	332,437	---	---	---	---	4,127	332,437	80,55
	Solomon Division: Kirwin unit.....	---	---	---	---	---	---	---	---	---
	Subtotal.....	12,834	1,017,899	---	---	---	---	12,834	1,017,899	79,31
Montana.....	Bitter Root.....	16,035	581,375	---	---	---	---	16,035	581,375	36,26
	Buffalo Rapids.....	20,916	1,300,557	---	---	---	---	20,916	1,300,557	62,18
	Frenchtown.....	3,573	214,850	---	---	---	---	3,573	214,850	60,13
	Huntley.....	23,207	1,450,005	---	---	---	---	23,207	1,450,005	62,48
	Inlake.....	731	24,709	---	---	---	---	731	24,709	33,80
	Lower Yellowstone (see also North Dakota):	30,663	2,537,180	---	---	---	---	30,663	2,537,180	82,74
	Milk River.....	87,549	4,089,553	---	---	---	---	87,549	4,089,553	46,71
	Missoula Valley.....	468	30,576	---	---	---	---	468	30,576	65,33
	Missouri River Basin:	3,206	141,534	---	---	---	---	3,206	141,534	44,15
	Three Forks Division: Crow Creek	---	---	---	---	---	---	---	---	---
	Pump unit.....	2,102	80,132	---	---	---	---	2,102	80,132	38,12
	Yellowstone Division: Savage unit.....	65,931	2,130,689	---	---	---	---	65,931	2,130,689	32,32
	Sun River.....	---	---	---	---	---	---	---	---	---
	Subtotal.....	254,381	12,581,160	---	---	---	---	254,381	12,581,160	49,46
Nebraska.....	Mirage Flats.....	11,298	1,077,173	---	---	---	---	11,298	1,077,173	95,34
	Missouri River Basin:	15,147	1,372,559	---	---	---	---	15,147	1,372,559	90,62
	Bostwick Division: Superior-Courtland	---	---	---	---	---	---	---	---	---
	unit.....	22,850	1,880,050	---	---	---	---	22,850	1,880,050	82,28
	Frenchman-Cambridge Division.....	5,165	320,233	---	---	---	---	5,165	320,233	92,00
	Middle Loup Division: Sargent unit.....	---	---	---	---	---	---	---	---	---
	Oregon Trail Division: Glendo Unit	---	---	21,239	1,534,082	---	---	21,239	1,534,082	72,23
	(see also Wyoming).	---	---	---	---	---	---	---	---	---
	North Platte (see also Wyoming).....	158,242	11,620,105	89,569	7,143,162	---	---	247,811	18,763,267	75,72
	Subtotal.....	212,702	16,270,120	110,808	8,677,244	---	---	323,510	24,947,364	77,11
Nevada.....	Humboldt.....	---	---	29,536	1,949,790	---	---	29,536	1,949,790	66,01
	Newlands.....	55,096	3,156,861	---	---	---	---	55,096	3,156,861	57,30
	Truckee Storage.....	---	---	21,512	1,698,004	---	---	21,512	1,698,004	78,93
	Subtotal.....	55,096	3,156,861	51,048	3,647,794	---	---	106,144	6,804,655	64,11

Umatilla Vale	12,809	902,215	11,029	1,086,069	489	44,523	24,327	2,032,807	83.56
	31,212	1,987,931					31,212	1,987,931	63.69
	302,646	29,596,838					414,603	42,584,853	102.71
Subtotal									
South Dakota	54,413	1,966,116					54,413	1,966,116	36.13
	11,098	662,875					11,098	622,875	59.73
			6,644	116,987			6,644	116,987	17.61
Subtotal									
Texas	65,511	2,628,991	6,644	116,987			72,155	2,745,978	38.06
	56,879	16,926,346	5,426	950,015			5,426	950,015	175.09
			6,844	1,873,718			63,723	18,800,064	295.03
Subtotal									
Utah	56,879	16,926,346	12,270	2,823,733			69,149	19,750,079	285.62
Hyrum	5,380	294,962					5,380	294,962	54.81
	58,117	1,297,570					58,117	1,297,570	22.33
	2,185	2,132,982					12,185	2,132,982	40.86
Newton	15,737	37,674					15,737	37,674	134.56
	37,674	3,375,868					37,674	3,473,868	32.25
	11,999	415,200					11,999	415,200	84.60
Sanpete	14,673	802,406					14,673	802,406	84.69
	21,464	1,681,629					39,547	2,663,377	67.40
	90,779	8,468,335					90,779	8,468,335	93.29
Subtotal									
Washington	15,636	796,759	258,008	18,686,074	2,447	186,989	276,091	19,669,822	71.24
Chief Joseph Dam	878	224,734					878	224,734	255.96
	238,312	27,302,370					238,312	27,302,370	114.57
	3,897	46,851,646					3,897	774,116	198.64
Okanogan	229,453		164,273	32,584,600	133	25,284	393,859	79,461,530	201.75
Subtotal									
Eden	472,540	75,152,866	164,273	32,584,600	133	25,284	636,946	107,762,750	169.19
Missouri River Basin:	11,629	330,793					11,629	330,793	28.45
	18,168	514,410					18,168	514,410	28.31
Bighorn Basin Division:	3,905	294,583					3,905	294,583	75.44
			8,656	286,177			8,656	286,177	33.06
Hanover-Bluff unit:									
Owl Creek unit:									
Oregon Trail Division: Glendo unit (see also Nebraska)	51,857	4,109,201					7,556	412,357	54.57
	49,455	1,956,766					66,867	4,988,367	74.60
	76,039	4,407,228					49,455	1,956,766	39.57
North Platte (see also Nebraska)							76,039	4,407,228	57.96
Shoshone	211,053	11,612,981	31,222	1,577,700			242,275	13,190,681	54.45
Subtotal									
Total all States									
	3,407,057	504,740,954	3,254,388	463,999,003	95,292	18,701,547	6,756,737	987,441,504	146.14

TABLE 6.—*Acreage, production, and gross crop value by crops and types of crops—1958*

Crops	Irrigated lands		Tonnage		Gross crop value	
	Total	Per cent of total	Total	Per cent of total	Total	Per cent of total ¹
Cereals:	<i>Acres</i>	<i>Per cent</i>	<i>Tons</i>	<i>Per cent</i>	<i>Dollars</i>	<i>Per cent</i>
Barley.....	574,508	8.50	767,349	2.45	31,028,905	3.14
Corn.....	310,387	4.60	593,777	1.90	24,863,306	2.52
Oats.....	189,242	2.80	168,396	.54	6,632,196	.67
Rice.....	7,487	.11	15,316	.05	1,659,068	.17
Rye.....	3,141	.05	2,212	.01	84,281	.01
Sorghums (sorgo, kaffir, etc.).....	112,706	1.67	160,864	.51	7,389,690	.75
Wheat.....	467,174	6.91	642,684	2.05	34,314,766	3.47
Other cereals.....	91,376	1.35	129,791	.41	4,869,577	.49
Subtotal.....	1,756,021	25.99	2,480,389	7.92	110,841,789	11.22
Forage:						
Alfalfa hay.....	1,594,768	23.60	6,138,162	19.61	103,886,801	10.52
Other hay.....	203,696	3.02	422,901	1.35	6,178,650	.63
Irrigated pasture.....	972,826	14.40	2,585,800	8.26	30,059,919	3.04
Corn fodder.....	19,188	.28	102,922	.33	642,000	.07
Silage or Ensilage.....	178,307	2.64	2,961,349	9.46	17,180,483	1.74
Crop residue:						
Beet tops.....			1,874,561	5.99	963,790	.10
Stubble, stalks, etc.....			126,794	.41	996,128	.10
Straw (all kinds).....			217,510	.70	813,343	.08
Root crops (carrots, etc.).....	143		1,160		7,484	
Other forage.....	50,553	.75	68,645	.22	538,953	.05
Subtotal.....	3,019,481	44.69	14,499,204	46.33	161,267,551	16.33
Miscellaneous Field Crops:						
Beans, castor.....	4,128	.06	5,102	.02	646,523	.07
Beans, dry and edible.....	369,533	5.47	333,185	1.06	37,853,499	3.83
Broomcorn.....	5,699	.08	1,362		292,552	.03
Cotton, lint (Upland).....	440,613	6.52	221,061	.71	153,136,818	15.51
Cotton, seed (Upland).....			359,853	1.15	15,750,695	1.60
Cotton, lint (American-Egyptian).....	42,202	.63	11,406	.04	11,990,256	1.21
Cotton, seed (American-Egyptian).....			22,362	.07	1,025,007	.10
Hops.....	20,402	.30	17,379	.06	19,785,440	2.00
Peppermint.....	12,575	.19	588		3,919,616	.40
Spearmint.....	3,016	.05	145		1,077,246	.11
Sugar Beets.....	364,508	5.39	6,807,696	21.75	72,864,912	7.38
Other miscellaneous field crops.....	4,942	.07	5,651	.02	412,040	.04
Subtotal.....	1,267,618	18.76	7,785,790	24.88	318,754,604	32.28
Vegetables:						
Asparagus.....	15,951	.24	20,097	.06	4,275,212	.43
Beans (processing).....	9,045	.13	17,030	.06	2,070,253	.21
Beans (fresh market).....	479	.01	967		233,667	.02
Broccoli.....	698	.01	2,155	.01	394,440	.04
Cabbage.....	3,876	.06	53,884	.17	3,110,520	.32
Carrots.....	9,459	.14	116,016	.37	8,849,022	.90
Cauliflower.....	81		616		47,901	
Celery.....	647	.01	16,725	.05	1,048,355	.11
Corn, sweet (processing).....	20,543	.30	104,623	.34	2,194,789	.22
Corn, sweet (fresh market).....	7,816	.12	21,545	.07	2,372,926	.24
Cucumbers.....	2,324	.03	22,610	.07	2,680,472	.27
Lettuce.....	57,929	.86	371,643	1.19	30,685,906	3.11
Melons:						
Cantaloupes, etc.....	27,563	.41	180,006	.58	13,523,277	1.37
Honey Ball, honeydew, etc.....	2,735	.04	32,330	.10	1,783,332	.18
Watermelons.....	9,605	.14	68,909	.22	2,976,167	.30
Onions, dry.....	14,168	.21	229,124	.73	10,530,316	1.07
Onions, green.....	636	.01	5,105	.02	797,565	.08
Peas, green (processing).....	11,767	.17	17,184	.05	1,492,525	.15
Peas, green (fresh market).....	1,179	.02	2,125	.01	495,905	.05
Peppers (all kinds).....	2,535	.04	20,118	.06	2,671,444	.27
Potatoes, early.....	52,960	.78	634,688	2.03	12,230,315	1.21
Potatoes, late.....	204,891	3.03	2,159,659	6.90	39,629,170	4.12
Squash.....	2,588	.04	11,197	.04	1,207,697	.12
Sweet Potatoes.....	909	.01	3,729	.01	359,583	.04

See footnotes at end of table.

TABLE 6.—*Acreage, production, and gross crop value by crops and types of crops—1958—Continued*

Crops	Irrigated lands		Tonnage		Gross crop value	
	Total	Per- cent of total	Total	Per- cent of total	Total	Per- cent of total ¹
Vegetables—Continued	<i>Acres</i>	<i>Per- cent</i>	<i>Tons</i>	<i>Per- cent</i>	<i>Dollars</i>	<i>Per- cent</i>
Tomatoes (canning).....	15,361	.23	173,374	.55	4,263,698	.43
Tomatoes (fresh market).....	9,999	.15	73,775	.24	12,789,353	1.30
Other vegetables.....	3,602	.05	25,097	.08	2,288,122	.23
Subtotal.....	489,346	7.24	4,384,331	14.01	165,001,932	16.71
Total Nursery.....	3,770	.06	-----	-----	8,175,947	.83
Seeds:						
Alfalfa.....	92,168	1.36	19,090	.06	10,686,175	1.08
Clover (all kinds).....	37,041	.55	7,235	.03	4,165,340	.42
Corn.....	5,079	.08	6,316	.02	987,942	.10
Flaxseed.....	42,497	.63	42,438	.14	4,674,454	.48
Grass (all kinds).....	15,004	.22	4,025	.01	2,184,830	.22
Lettuce.....	986	.01	169	-----	252,785	.03
Onion.....	726	.01	205	-----	336,533	.04
Pea.....	27,243	.40	24,335	.08	2,277,338	.23
Potato (all kinds).....	1,506	.02	16,397	.05	524,099	.05
Sugar beet.....	2,508	.04	3,761	.01	1,091,325	.11
Other seed.....	9,106	.14	7,144	.02	1,115,238	.11
Subtotal.....	233,864	3.46	131,115	.42	28,296,059	2.87
Fruits:						
Apples.....	43,119	.64	414,602	1.32	21,737,159	2.20
Apricots.....	7,562	.11	43,873	.14	3,886,725	.39
Berries (all kinds).....	1,459	.02	2,538	.01	860,806	.09
Cherries.....	6,138	.09	19,884	.06	4,811,307	.49
Citrus.....	17,157	.25	121,307	.39	7,874,984	.80
Grapefruit.....						
Lemons and limes.....	10,867	.16	114,702	.37	6,573,022	.66
Oranges and tangerines.....	29,915	.44	233,606	.74	27,116,632	2.75
Dates.....	4,108	.06	19,231	.06	5,797,779	.59
Grapes, table.....	56,508	.84	350,381	1.12	31,621,298	3.20
Grapes, other.....	32,756	.49	218,078	.70	15,275,668	1.55
Olives.....	8,035	.12	24,071	.08	2,499,376	.25
Peaches.....	25,768	.38	169,124	.54	10,870,218	1.10
Pears.....	25,249	.37	215,605	.69	12,991,518	1.32
Prunes and plums.....	9,291	.14	51,476	.16	5,456,719	.55
Other fruits.....	3,394	.05	8,194	.03	1,118,259	.11
Subtotal.....	281,326	4.16	2,006,672	6.41	158,491,470	16.05
Nuts:						
Almonds.....	6,494	.10	1,374	.01	1,097,454	.11
Pecans.....	5,126	.08	2,813	.01	1,938,630	.20
Walnuts.....	5,599	.08	4,221	.01	1,597,284	.16
Other nuts.....	157	-----	118	-----	47,100	-----
Subtotal.....	17,376	.26	8,526	.03	4,680,468	.47
Family gardens and orchards.....	22,520	.33	-----	-----	5,023,856	.51
Total, all crops.....	7,091,322	104.95	31,296,027	100.00	960,533,676	97.27
Less multiple cropped.....	480,426	7.11	-----	-----	-----	-----
Total harvested cropland and pasture.....	6,610,896	97.84	-----	-----	-----	-----
Cropland not harvested.....	118,577	1.76	-----	-----	-----	-----
Soil building.....	27,264	.40	-----	-----	-----	-----
Acres irrigated.....	6,756,737	100.00	-----	-----	-----	-----
Additional revenues ²	-----	-----	-----	-----	26,907,828	2.73
Total gross crop value.....	-----	-----	-----	-----	987,441,504	100.00
Full irrigation service.....	3,407,057	50.42	-----	-----	504,740,954	51.11
Supplemental irrigation service.....	3,254,388	48.17	-----	-----	463,999,003	46.99
Temporary irrigation service.....	95,292	1.41	-----	-----	18,701,547	1.90

¹ Additional revenues are included in computing percentages.

² Includes payments received from Federal and commercial agencies.



Reclamation plays major role in western livestock economy—Feed grains and forage for livestock occupy seven-tenths of irrigated lands on Reclamation projects and play a strategic role in enhancing and supplementing the productivity of Western range lands. These Herefords are being fattened on the Grand Valley project at Grand Junction, Colo. Note the ensilage corn in the background.

The grain and forage crops which occupy about seven-tenths of the irrigated land provided 17 million tons of feed for use on the farms and ranches of the West (table 6). These feed crops, together with the specialty crops, the fruits, nuts, and vegetables, and the nurseries and home gardens complement the Nation's agriculture. Because of Reclamation, a better balance is attained in the total food and fiber production of the Nation.

Municipal and Industrial Water

Bureau of Reclamation projects provided 260 billion gallons of water for municipal and industrial and other nonirrigation uses in 1958. This usage occurred on 32 projects involving 106 municipal and 68 industrial entities.

More than two-thirds of this municipal and industrial water was furnished to the Metropolitan Water District of Southern Cali-

ifornia, a water utility district serving more than 75 cities, including Los Angeles and San Diego. Some of the other important cities receiving water service from Reclamation works include Salt Lake City, El Paso, Phoenix, Yuma, Las Vegas, Rapid City, Fort Collins, and Ogden.

About 8½ million persons live in the municipal and industrial water service entities which are served by the Bureau. These are in addition to the 790,000 persons who live on irrigated homesites on the fringes of the cities and towns on Reclamation projects. Nearly a half-million persons make up the farm families who reside on the project farms. Thus the daily activities of nearly 10 million persons are vitally affected by Reclamation water supplies.

Recreation Facilities and Usage

The 11⅓ million acres of water surface area at Reclamation reservoirs provide an opportunity for people to engage in a wide range

Water recreation for the semiarid West—Bureau of Reclamation reservoirs provide a total normal water surface area of 1⅓ million acres for boating, swimming, fishing and other water recreation. This picture shows a portion of the shoreline on the Bureau's Deer Creek Reservoir in Utah during the fishing season. Such "man-made" lakes are not only scenic attractions in the mountain-desert land, but also are among the outstanding fishing spots in the West today.



of water sports. About 19.5 million visitor days of use were recorded at Reclamation project areas in 1958. This was comprised as follows:

TABLE 7.—*Recreational visits to Bureau of Reclamation reservoirs, 1958*

Activity	Visitor days
Sightseeing.....	7, 181, 000
Fishing.....	4, 112, 000
Boating and water skiing.....	2, 507, 000
Picnicking.....	2, 174, 000
Swimming.....	1, 419, 000
Camping.....	1, 094, 000
Hunting.....	339, 000
Other.....	572, 000
Total.....	19, 458, 000

The tremendous pressures of public visitations to the reservoirs—which tripled in the past 8 years—reemphasize each year the need to provide the facilities which will adequately safeguard the visitors as well as the physical works themselves. On only a relatively few of the projects has authority been provided to include public use facilities. For the greater majority of the projects, the entire cost and responsibility for installation and maintenance of public use facilities, if provided at all, rests with the organization responsible for recreational administration.

Repayment and Water Service Contracts

During fiscal 1959, more than 40 contracts were executed with districts for the repayment of costs of Reclamation project works. Repayment, water service, and loan repayment contracts were executed for projects constructed under the terms and conditions of: (1) general reclamation law; (2) Small Reclamation Projects loan program authorized by the Small Reclamation Projects Act of 1956; and (3) the Rehabilitation and Betterment Act of October 7, 1949. The largest contract executed during the year was for \$13,184,000 with the San Angelo Water Supply Corporation. A summary of the principal repayment and water service contracts executed is presented in table 8.

Only one small project loan repayment contract was executed prior to fiscal 1959. During the past fiscal year, six small project loan repayment contracts were executed with a total repayment obligation of \$10,099,000. Contract obligations vary from \$402,000 to \$3,510,000, and average about \$2,000,000. The maximum contribution by the Federal Government for a single project is limited by the authorizing legislation to \$5,000,000. Loan funds are ad-

RECREATION

an extra dividend



19.5 MILLION VISITOR DAYS USE

Recreation—an extra dividend of reclamation—Dots on this map represent water recreation areas developed by the Bureau of Reclamation. These areas, which now provide more than 19½ million visitor days of recreational use, are a dividend of a western program that builds control facilities to develop water for other major purposes—essentially domestic, agricultural and industrial uses. Recreational administration of these areas normally is transferred to other Federal, State, and local public agencies.

vanced to a District only after the executed contract has been validated by appropriate court action. Also approved were the form of four additional loan repayment contracts, totaling \$11,045,000.

Loan repayment periods vary between 22 and 50 years; however, only two are for the authorized maximum 50-year period. Interest, currently at the rate $3\frac{1}{8}$ percent annually, will be paid on the unamortized portions of the loans associated with the delivery of

TABLE 8.—*Repayment and water service contracts executed in fiscal year 1959*

Project	Contracting parties	Type of contract ¹	Contract repayment obligation	Repayment or contract period
			<i>Dollars</i>	<i>Years</i>
Arnold.....	Arnold Irrigation District.....	R&B.....	45,000	18
Boise.....	Individuals for purchase of space in Deadwood Reservoir.	Rpymt.....	7,515.20	40
Buford-Trenton.....	Buford-Trenton Irrigation District.	Amend. Rpymt.....		(2)
Central Utah.....	Uintah Water Conservancy District.	W/S & Rpymt.....	1,500,000	50
Central Valley.....	Tea Pot Dome Water District.	W/S & Distr. System Rpymt.	1,800,000	40
Do.....	El Dorado County (Water service to the Lake Hills Estate Water Maintenance District).	M&I W/S.....	(3)	40
Do.....	Proberta Water District.....	W/S.....	(3)	Until 1995
Do.....	Lindsay-Strathmore I.D.....	Suppl. W/S.....	(3)	Until Dec. 31, 1988
Do.....	Madera Irrigation District.....	Suppl. Distr. System Rpymt.	5,177,000	40
Do.....	Romero Water District.....	W/S.....	(3)	Until 1995
Do.....	San Luis Water District.....	W/S.....	(3)	Until 1995
Do.....	Eagle Field Water District.....	W/S.....	(3)	Do.
Do.....	El Dorado Irrigation District.	Distr. System Rpymt.	4,000,000	40
Do.....	Oro Loma Water District.....	W/S.....	(3)	Until 1995
Do.....	Stone-Corral Irrigation District.	Amend. W/S.....	1,888,000	40
Do.....	Delano-Earlimart I.D.....	Amend. (W/S.....	(3)	(3)
Do.....	Summit City Public Utility District.	Amendatory, M&I W/S.....	(3)	(2)
Do.....	Lindsay-Strathmore I.D.....	Amend. W/S.....	(3)	(3)
Do.....	Lindmore Irrigation District.	Amend. W/S.....	(3)	(3)
Do.....	Ivanhoe Irrigation District.....	Amend. W/S.....	(3)	(3)
Crooked River.....	Hudspeth Land & Livestock Co.	Rpymt.....	73,920	50
Lower Rio Grande.....	Hidalgo and Cameron Counties Water Control and Improvement District No. 9.	Rpymt.....	10,800,000	35
Milk River.....	Malta Irrigation District.....	R&B.....	143,418	Beginning 1960 and continuing until obligation paid.
	Glasgow Irrigation District.....	R&B.....	60,720	
Missouri River Basin.....	Clark Canyon Water Supply Co.	W/S.....	1,160,000	40
Do.....	East Bench Irrigation District.	W/S & Rpymt.....	1,744,000	40
Do.....	H&RW Irrigation District.....	Amend. W/S and Distr. System Rpymt.	(2)	(2)
Do.....	Angostura Irrigation District.	Amend. W/S.....	(2)	(2)
Do.....	Kirwin Irrigation District No. 1.	Amend. Rpymt.....	(2)	(2)
Do.....	City of Helena.....	W/S.....	(3)	(3)
North Platte.....	Pathfinder Dam Outlet Works (Several Contractors).	R&B.....	180,000	5
Orland.....	Orland Unit Water Users' Association	R&B.....	250,000	30
Rio Grande.....	El Paso County Water Improvement District No. 1	R&B.....	2,300,000	5
Rogue River.....	Rogue River Valley I.D.....	Rpymt. & R&B.....	580,500	60
Do.....	Medford Irrigation District.	Rpymt. & R&B.....	964,000	60
Salt River.....	Salt River Valley Water Users' Association	R&B.....	8,000,000	30
San Angelo.....	San Angelo Water Supply Corp.	Rpymt.....	13,184,000	40
Do.....	Tom Green County Water Control and Improvement District No. 1.	Rpymt.....	4,000,000	40
Shoshone.....	Heart Mountain Irrigation District	Rpymt.....	7,000,000	121
Small projects.....	South Davis County Water Improvement District.	Loan Rpymt.....	634,000	Not to exceed 40 years
Do.....	Walker River I.D.....	Loan Rpymt.....	563,000	40
Do.....	Bountiful Subconservancy District	Loan Rpymt.....	3,510,000	50

See footnotes at end of table.

TABLE 8.—*Repayment and water service contracts executed in fiscal year 1959—Continued*

Project	Contracting parties	Type of contract ¹	Contract repayment obligation	Repayment or contract period
			<i>Dollars</i>	<i>Years</i>
Small projects.....	Goleta County Water District	Loan Rpymt.....	2,080,000	40
Do.....	Roosevelt Water Conservation District.	Loan Rpymt.....	2,780,000	22
Do.....	Centerville-Deuel Creek Irrigation Company	Loan Rpymt.....	402,000	48
Sun River.....	Fort Shaw Irrigation District	R&B.....	100,000	10
Tucumcari.....	Arch Hurley Conservancy District	Amend. Rpymt...	(2)	Variable
Umatilla.....	Contracts with individuals McKay Reservoir	Rpymt.....	56,520	Various
Yakima.....	Kennewick Irrigation District	Amend. Rpymt...	(2)	(2)

¹ Types of contracts are: W/S (water service); Rpymt. (repayment); R&B (rehabilitation & betterment); and Loan Rpymt. (loan repayment).

² No change in repayment obligation and/or repayment period.

³ Water service contract.

⁴ Plus interest.

water to excess land holdings under the provisions of Reclamation law, or for nonagricultural water service.

Ten contracts were executed by the Secretary of the Interior during the past year for the rehabilitation and betterment of facilities of existing Federally authorized Reclamation projects. These contracts comprise work having a total unmaturred repayment obligation value of \$11,718,000. Repayment schedules for rehabilitation and betterment work are adapted to the needs of the contractors by recognizing prior repayment commitments. Consequently, repayment periods for these contracts vary from as little as 5 years to as much as 60 years. The contract with the Salt River Water Users' Association is the largest R&B repayment contract executed in the Bureau's history. Work covered by the \$8 million contract will be carried out over a period of 8 years and will be repaid by the Association in 30 years.

Three Public Law 130 distribution system loan repayment contracts were approved as to form during fiscal 1959. Two of these contracts have been executed by the districts and will be executed on behalf of the United States as soon as funds for distribution system construction loans are made available. The two loan contracts constitute a total repayment obligation of \$7,300,000. The maximum permissible loan repayment period under the distribution system loan act is limited to 40 years.

Table 9 shows that the total value of all repayment contracts on June 30, 1959, amounted to \$916,073,149. Of this amount a total of \$148,294,832 has been repaid and delinquencies were insignificant. In addition, over \$125 million will be returned to the Government in water service payments under contracts now in force.

TABLE 9.—*Repayment contracts—matured and unmatured, June 30, 1959*

Project and State	Value of repayment contracts			Unmatured value of repayment contracts			Matured value of repayment contracts	Amount due and unpaid	
	Construction	Rehabilitation and betterment	Total	Construction	Deferred charges	Rehabilitation and betterment			Total
PROPERTY TITLED IN UNITED STATES									
Avondale, Idaho.....	\$244,423.61		\$244,423.61	\$238,828.15	\$20,193.25		\$238,828.15	\$5,595.46	
Baker, Oregon.....	225,014.54		225,014.54	75,006.14			95,199.39	129,815.15	
Balmorhea, Texas.....	255,600.00		255,600.00	226,611.50			226,611.50	28,988.50	
Belle Fourche, South Dakota.....	4,230,059.65		4,230,059.65	2,601,025.95			2,601,025.95	1,629,033.70	
Bitter Root, Montana.....	1,052,741.05	\$225,000.00	1,277,741.05	650,057.60		\$213,750.00	863,807.60	413,933.45	
Boise, Idaho-Oregon.....	28,276,092.06	2,225,000.00	30,501,092.06	13,794,578.41	976,321.14	2,225,000.00	16,995,899.55	\$80.00	
Boulder Canyon: All-American Canal System, California.....	52,444,205.61		52,444,205.61	50,674,253.24			50,674,253.24	1,769,952.37	
Buffalo Rapids, Montana.....	1,376,326.20		1,376,326.20	1,264,168.66			1,264,168.66	112,157.54	
Burnt River, Oregon.....	599,735.00		599,735.00	299,856.72			299,856.72	299,878.28	
Cachuma, California.....	5,653,221.92		5,653,221.92	5,645,550.64			5,645,550.64	7,671.28	
Carlsbad, New Mexico.....	3,721,944.04	25,000.00	3,746,944.04	1,679,093.00	64,070.00	21,500.00	1,764,663.00	1,982,281.04	
Central Utah, Vernal Unit, Utah.....	1,500,000.00		1,500,000.00	1,500,000.00			1,500,000.00		
Central Valley, California.....	75,771,022.35		75,771,022.35	75,020,074.27			75,020,074.27	750,948.08	
Chief Joseph Dam, Foster Creek Division, Washington.....	1,373,200.00		1,373,200.00	1,373,200.00			1,373,200.00		
Collbran, Colorado.....	1,070,000.00		1,070,000.00	1,070,000.00			1,070,000.00		
Colorado-Big Thompson, Colorado.....	26,032,704.85		26,032,704.85	26,032,491.75			26,032,491.75	213.10	
Colorado River, Texas.....	5,510,500.00		5,510,500.00	5,510,500.00			5,510,500.00		
Columbia Basin, Washington.....	87,549,400.06		87,549,400.06	87,471,954.62			87,471,954.62	198.25	
Crescent Lake Dam, Oregon.....	2,076,060.00	320,000.00	2,396,060.00	2,076,060.00		312,000.00	312,000.00		
Crooked River, Oregon.....	2,076,060.00		2,076,060.00	2,076,060.00			2,076,060.00		
Dalton Gardens, Idaho.....	258,659.63		258,659.63	252,193.13			252,193.13	6,466.50	
Dschutes, Oregon.....	12,757,159.80		12,757,159.80	12,363,945.96			12,363,945.96	393,213.84	
Eden, Wyoming.....	1,500,000.00		1,500,000.00	1,500,000.00			1,500,000.00		
Fort Sumner, New Mexico.....	2,432,166.55		2,432,166.55	2,249,754.07			2,249,754.07	182,412.48	
Frenchtown, Montana.....	297,282.04		297,282.04	215,271.66			215,271.66	82,010.38	
Fullingmores Dam, Colorado.....	198,240.71		198,240.71	125,450.15			125,450.15	72,790.56	
Gila, Arizona.....	48,116,167.45		48,116,167.45	48,041,945.09			48,041,945.09	74,222.36	
Grand Valley, Colorado.....	2,124,314.37	1,874,117.73	3,998,432.10	1,173,184.76			3,001,802.49	996,629.61	
Humboldt, Nevada.....	1,211,244.68	122,998.46	1,334,243.14	644,150.90	26,902.68	1,828,617.73	794,052.04	540,191.10	
Huntley, Montana.....	1,839,673.68	84,262.50	1,923,936.18	623,778.42	88,085.37	122,998.46	796,126.29	1,127,809.89	
Hurum, Utah.....	944,046.36		944,046.36	617,699.45		84,262.50	617,699.45	326,346.91	
Inlake, Montana.....	46,900.00		46,900.00	39,712.00			39,712.00	7,188.00	
Kendrick, Wyoming.....	600,000.00		600,000.00	600,000.00			600,000.00		

TABLE 9.—*Repayment contracts—matured and unmatured, June 30, 1959—Continued*

Project and State	Value of repayment contracts			Unmatured value of repayment contracts				Matured value of repayment contracts	Amount due and unpaid
	Construction	Rehabilitation and betterment	Total	Construction	Deferred charges	Rehabilitation and betterment	Total		
PROPERTY TITLED IN UNITED STATES—Continued									
Vermelo, New Mexico.....	2, 107, 943.33	-----	2, 107, 943.33	2, 107, 943.33	-----	-----	2, 107, 943.33	-----	-----
W. C. Austin, Oklahoma.....	3, 262, 188.49	-----	3, 262, 188.49	2, 526, 655.00	-----	-----	2, 526, 655.00	735, 533.49	-----
Wapinitia, Oregon.....	546, 130.00	-----	546, 130.00	546, 130.00	-----	-----	546, 130.00	-----	-----
Washita Basin, Oklahoma.....	23, 991, 500.00	-----	23, 991, 500.00	23, 991, 500.00	-----	-----	23, 991, 500.00	-----	-----
Weber Basin, Utah.....	57, 694, 000.00	-----	57, 694, 000.00	57, 694, 000.00	-----	-----	57, 694, 000.00	-----	-----
Weber River, Utah.....	2, 685, 871.83	-----	2, 685, 871.83	617, 350.34	-----	-----	617, 350.34	2, 068, 521.49	-----
Yakima, Washington.....	46, 497, 633.59	-----	47, 566, 096.06	31, 975, 141.54	19, 747.89	780, 834.86	32, 775, 724.29	14, 790, 371.77	3, 684.46
Yuma, Arizona-California.....	5, 354, 257.83	-----	5, 354, 257.83	123, 559.90	-----	-----	123, 559.90	5, 230, 697.93	1, 282.14
Yuma Auxiliary, Arizona.....	1, 511, 954.40	-----	1, 511, 954.40	899, 099.92	-----	-----	899, 099.92	612, 854.48	2, 046.08
Subtotal, U. S. title.....	885, 964, 482.29	25, 244, 939.35	911, 209, 421.64	745, 676, 217.77	2, 835, 100.62	23, 210, 190.33	771, 721, 508.72	139, 487, 912.92	117, 503.57
PROPERTY TITLED IN WATER USERS									
Arnold, Oregon.....	-----	197, 925.82	197, 925.82	-----	-----	163, 569.21	163, 569.21	34, 356.61	-----
Grand Valley, Colorado.....	-----	1, 268, 176.49	1, 268, 176.49	-----	-----	594, 283.81	594, 283.81	673, 892.68	-----
Grants Pass (S. R. D.), Oregon.....	-----	808, 794.56	808, 794.56	-----	-----	785, 294.56	785, 294.56	23, 500.00	-----
Palo Verde, Arizona-California.....	-----	500, 000.00	500, 000.00	-----	-----	475, 000.00	475, 000.00	25, 000.00	-----
Rogue River, Oregon.....	-----	1, 991, 000.00	1, 991, 000.00	-----	-----	1, 991, 000.00	1, 991, 000.00	-----	-----
Umatilla, Oregon.....	-----	97, 830.24	97, 830.24	-----	-----	47, 660.84	47, 660.84	50, 169.40	-----
Subtotal, water users title.....	-----	4, 863, 727.11	4, 863, 727.11	-----	-----	4, 056, 808.42	4, 056, 808.42	806, 918.69	-----
Total repayment contracts.....	885, 964, 482.29	30, 108, 666.46	916, 073, 148.75	745, 676, 217.77	2, 835, 100.62	27, 266, 998.75	775, 778, 317.14	140, 294, 831.61	1 117, 503.57

1 \$113, 328.77 collected by September 30, 1959.

Weed Control

The comprehensive weed control program conducted by the Bureau of Reclamation is effectively reducing problems caused by undesirable vegetation and decreasing operation and maintenance costs. It also is aiding materially in reducing water losses resulting from transpiration, evaporation and seepage due to weed growths.

More efficient and economical methods of controlling weeds infesting banks and channels of irrigation and drainage systems were developed and put into practice through research conducted in cooperation with the Department of Agriculture. This phase of the program is being accomplished at four field stations in the West and the Assistant Commissioner and Chief Engineer's weed control laboratory in Denver. The cooperative research program in the laboratory has been enlarged and now two Bureau of Reclamation and two Department of Agriculture scientists are devoting full time to this work.

The ditchbank seeding program to prevent and control weed growths and erosion was continued with excellent results. The educational program which has been successful in advising project personnel of new and more economical methods for controlling weeds also was continued through the distribution of motion pictures, slide lectures, manuals, special releases on new equipment, and articles in the Reclamation Era.

Work was continued for developing more effective methods for controlling salt cedar (tamarisk) in the Southwest. Progress was made also in controlling other woody phreatophytes where these plants have invaded irrigation systems, natural water courses, reservoirs and other areas. These growths not only usurp millions of acre-feet of water so greatly needed for irrigation and municipal and industrial purposes but also increase flood hazards and take over lands which should be used for grazing and agriculture. It is estimated that in the 17 Western States, undesirable phreatophytes infest more than 15 million acres and transpire at least 25 million acre-feet of water. Committees composed of representatives of the Departments of Agriculture and Interior, including the Bureau of Reclamation, are working on this and other weed control problems common to Government agencies.

Much progress has been made in a comparatively short time toward reducing costs and water losses caused by weeds on irrigation systems. It is estimated that in 1959 the losses due to weeds on irrigation systems were reduced \$12 million annually, as compared to 1948. However, all weed problems have not been solved as economically as desired. Therefore, research is being continued

as planned to aid in solving this major problem of irrigation systems.

A halogeton control program has been developed in cooperation with other agencies under the provisions of the Halogeton Glomeratus Act (Public Law 529, July 14, 1952) in the interest of increasing the land use value of Bureau-administered lands and of protecting the livestock. Surveys to locate halogeton infestations were continued in Utah, Nevada, Colorado, Wyoming, and Idaho, as were the cooperative investigations to determine the most effective and economical control methods. The actual control programs, including chemical spraying and grass seeding, were continued primarily through agreements with the Department's Bureau of Land Management.

Soil and Moisture Conservation

A major objective of the Bureau of Reclamation is the efficient application of water to soil without waste or erosion. The Bureau encourages agricultural agencies and cooperates with them in research or conducts research directed toward water saving methods of irrigation, evaporation control, transpiration losses and seepage control, including canal linings.

The Bureau is interested also in soil and moisture conservation on the lands under its jurisdiction, such as those surrounding reservoirs or other areas withdrawn or acquired for reclamation purposes. This work is done in accordance with Reorganization Plan IV and in fiscal year 1959 covered 108 individual soil and moisture conservation programs on 49 Federal irrigation projects or units.

These operations help protect Reclamation-built facilities from adverse effects of soil erosion. The work undertaken includes watershed reseeding, erosion control structures, and vegetation, pest and dune control measures.

The program objectives are accomplished in cooperation with other Federal agencies, state and local agencies. Water user organizations also assist in planning, and frequently furnish a part of the labor, materials, and funds.

Land Acquisition and Management

The Bureau followed its policy of restoring or selling lands in excess of its requirements for the control, protection or construction of reclamation facilities. Where lands to be retained were suitable for secondary purposes such as grazing, recreation, or wildlife, they were, wherever possible, turned over to the proper agencies for

administration. Of the 10 million acres of land under the Bureau's jurisdiction there are now about 7 million acres being administered by the Department's Bureau of Land Management and National Park Service, and State and local organizations.

Cooperation with Other Agencies

The Bureau's activities in planning, developing and operating Federal irrigation projects have been greatly facilitated through cooperation with other agencies or organizations. The special skills, experience and equipment of these agencies have been fully utilized whenever it was to the advantage of the Government, in the conservation of our natural resources and its broad application to irrigation and other water uses.

Reclamation reservoir facilities preserve migrating fish.—Measures and facilities to enhance fish and wildlife resources are incorporated in the planning of Bureau of Reclamation water storage projects. Here at the Lewiston fish facilities of the Trinity Division of California's Central Valley project, salmon are seen rising from the fish sweep to continue their way to upstream spawning areas.



The cooperative work is implemented by means of agreements between the Bureau and the other organizations involved, which now include several agencies within the Department of Agriculture, the State Colleges and Extension Services of the 17 Western States, and many other Federal, State and local organizations.

During fiscal year 1959 there were 339 such cooperative agreements in effect. They include studies and investigations conducted on development farms, conservation and efficient use of soil and water, crop and cropping problems, assistance to county, agricultural agents, and weed control studies. They cover also the development and management of reservoir recreational and wildlife areas, and assistance in solving many other problems pertaining to the development and operation of irrigation projects.

Rehabilitation and Betterment of Existing Projects

To place older projects on a basis comparable to projects now being constructed so far as conservation of water, efficiency of operation, and adequacy of drainage are concerned, it is necessary for the facilities to be rehabilitated and improved. In some instances these improvements cannot be accomplished by an annual operation and maintenance program that is within the water users' ability to finance on a current basis; they can be accomplished only by a rehabilitation and betterment program that is within their ability to pay over an extended period. In these instances contracts are entered into, prior to start of construction, with the irrigation districts concerned for the repayment of the total cost of the work. The annual rate of repayment by the water users is based on their ability to pay, after giving due consideration to other outstanding repayment obligations.

Accomplishments this year emphasized the increased irrigation efficiency and the conservation of water made possible through canal lining, improved irrigation structures, and improved drainage.

During the year rehabilitation and betterment work was in progress on 13 projects as follows:

Bitter Root project, Montana.—Flume and siphon rehabilitation and repair work on the main canal.

Boise project, Idaho.—Repairing and strengthening the New York Canal which serves the Arrowrock Division.

Grand Valley project, Colorado.—Rehabilitation and repair of the Grand Valley Diversion Dam and appurtenant works.

North Platte project, Nebraska and Wyoming.—Rehabilitation of Pathfinder Dam north tunnel outlet works, installation of 7.8 miles

of membrane lining, and 2.5 miles of concrete irrigation pipe on the lateral system.

Ogden River project, Utah.—Rehabilitation and betterment of the distribution facilities.

Okanogan project, Washington.—Protective riprap placed at higher levels on the upstream face of Conconully* Dam, and the outlet works tunnel and spillway rehabilitated.

Orland project, California.—Urgently needed canal relining.

Owyhee project, Idaho and Oregon.—Rehabilitation and betterment of pumping plants and the Succor Creek Diversion Dam and the installation of water measuring devices in canals and laterals.

Riverton project, Wyoming.—Placement of asphaltic membrane lining of the pilot canal and laterals and the Wyoming laterals (Second Division). Also drainage construction.

Rogue River Basin project, Oregon.—Rehabilitation of Medford Irrigation District and the Rogue River Valley Irrigation District distribution systems and the Medford Canal. The work includes placement of concrete lining; replacing bridges, farm turnouts, flumes, and other small structures; installing concrete pipe and repairing canal banks.

Salt River project, Arizona.—Lining on one or both banks of main canals at critical locations with approximately 400,000 square feet of reinforced, pneumatically applied mortar and unreinforced concrete; constructing three additional canal structures; lining approximately 24 miles of laterals and replacing approximately 10 miles of open laterals with underground concrete pipe lines and rehabilitating additional lateral structures.

Sun River project, Montana.—Started on rehabilitation and betterment of canals and laterals under a performance contract with Fort Shaw Irrigation District.

Yakima project, Washington.—Continued work on main drains of the Sunnyside Division.

Development Farms

Development farms have proved to be an important part of the settlement program on new areas being developed for irrigation. The Bureau's field-scale demonstrations and the research conducted by cooperating agricultural agencies on these farms furnish much valuable information for the use of the new settlers, and remove many of the factors which caused hardships and often failures of settlers on earlier developed projects. They also aid in the conservation of soil and water through promoting more efficient use of these important natural resources.

Development farms are established as far as possible in advance of settlement, usually 2 to 5 years, in order that much of the necessary experience and information will have been obtained when the new settlers arrive. The farms are located in areas which best represent the soils and other conditions of the new project.

The major portion of each farm is devoted to field-scale demonstrations of approved farm irrigation systems, irrigation methods, kinds and varieties of adapted crops, cultural practices, weed control, farm drainage and solutions to other problems with which new irrigation farmers are faced. From 10 to 25 percent of most of the farms is set aside for research, which is conducted by State College Experiment Stations and cooperating agricultural agencies. The research may include investigations regarding fertilizer requirements, handling of problem soils, water requirements, plant diseases, insect pests, and other problems peculiar to a particular area. Farming methods developed from research and thoroughly tested are demonstrated on the farms. Some farms also have aided in determining feasibility of projects. Farms not operated by the owners are leased to carefully selected, experienced farmers as soon as the land is cleared and leveled and the necessary buildings constructed. This method of operation has resulted in the farms becoming self-supporting.

Eleven development farms were in operation during the year; 17 farms previously operated have served their purpose and were discontinued. Operating farms are located in the Wellton-Mohawk Division of the Gila project, Arizona, and in several units of the Missouri River Basin project. Additional farms are proposed for new areas scheduled for development.

The Bureau of Reclamation and other agencies responsible for the development farms work closely with the State College Extension Services to be certain that the information from research findings and demonstrations is properly disseminated to the new settlers. Hundreds of farmers attend the annual field days and tours at which representatives of the Bureau and the cooperating agencies explain the work in detail. Project settlers are encouraged to visit the farms at any time to obtain information. Information pamphlets are prepared and distributed. The development farms also benefit college and high school students who visit the farms with their instructors.

Land Settlement

The Bureau conducted one land opening on the Columbia Basin project, making available for settlement 31 farm units embracing

3,223 irrigable acres of new land in the South-Columbia and Quincy-Columbia Basin irrigation districts.

Since the close of World War II, 62 land openings have been held on 14 Reclamation projects. A total of 2,756 new farm units, encompassing 263,856 irrigable acres of public land, have been made available for selection by qualified applicants.

Availability of additional new farm units is anticipated next fiscal year on the Columbia Basin project in Washington and on the Minidoka project in Idaho. Contingent on final determination of land requirements along the Gila River, in connection with flood control studies being conducted by the U.S. Army Corps of Engineers, a few additional units may become available from time to time on the Gila project in Arizona.

Additional privately owned lands in the Central Valley, Columbia Basin, and Missouri River Basin projects will be supplied with irrigation water. A considerable amount of this privately owned land may be available for sale by the owners.

Hydroelectric Power Development

In order to utilize to the greatest advantage the water supplies made available by multipurpose reservoirs, the Bureau of Reclamation has constructed and, as of June 30, 1959, operated 41 powerplants with an installed nameplate capacity of 5,137,550 kilowatts. In addition, the Bureau is responsible for marketing the power generated at four powerplants constructed by the U.S. Army Corps of Engineers with a total installed nameplate capacity of 745,000 kilowatts and one powerplant installed by the International Boundary and Water Commission, with a total nameplate capacity of 31,500 kilowatts.

Sale of electric power by the Bureau during the year aggregated 26,504,260,413 kilowatt hours, with revenues from sales totaling \$70,968,412, as shown in table 10.

Fiscal Year Expansion

During the year the installed nameplate capacity of hydroelectric powerplants at Bureau multipurpose projects, and at projects for which the Bureau markets power, was increased 45,450 kilowatts. The 1,400 kilowatt Lingle hydroelectric powerplant was retired. This resulted in a net increase of 44,050 kilowatts in installed nameplate capacity over last year.



Power for western industrial expansion.—Hydroelectric power from Bureau of Reclamation projects plays a major role in the great postwar population and industrial expansion of the West. Revenues from power sales also are a major element in repayment of project construction costs. This workman is dwarfed by the huge bushings on the 230-kilovolt oil circuit breakers in the switchyard at the Hungry Horse powerplant in Montana.

TABLE 10.—*Bureau of Reclamation power systems, power sales, and revenues by projects, fiscal year ending June 30, 1959*

Projects	Sales of electric energy, kilowatt-hours ¹	Revenues from sales ¹
Boise.....	119, 171, 215	\$299, 466. 48
Boulder Canyon.....	4, 104, 549, 853	9, 885, 374. 15
Central Valley.....	2, 971, 395, 218	11, 799, 215. 17
Columbia Basin ²	10, 794, 542, 000	12, 912, 684. 20
Eklutna.....	159, 437, 228	1, 633, 407. 32
Falcon.....	166, 058, 300	470, 502. 50
Fort Peck.....	210, 510, 189	1, 000, 305. 80
Hungry Horse ²	1, 014, 791, 100	3, 822, 705. 42
Mimidoka.....	167, 776, 240	792, 365. 65
Missouri River Basin: Eastern Division.....	3, 346, 540, 590	12, 336, 480. 70
Missouri River Basin: Western Division ²	1, 195, 352, 695	7, 295, 028. 94
North Platte.....	120, 043, 339	767, 076. 14
Palisades.....	512, 068, 029	1, 609, 016. 88
Parker-Davis.....	1, 367, 152, 329	5, 439, 354. 67
Provo River Basin.....	15, 806, 647	47, 931. 26
Rio Grande.....	86, 871, 397	431, 553. 32
Weber Basin.....	6, 329, 826	21, 577. 22
Yakima ²	135, 498, 231	374, 076. 55
Yuma.....	10, 365, 987	30, 289. 65
Grand total.....	26, 504, 260, 413	70, 968, 412. 02

¹ Does not include energy sales and revenues in transactions between Bureau projects.² Deliveries to and revenues from Bonneville Power Administration included as follows:

	Kilowatt-hours	
Columbia Basin.....	10, 194, 033, 586	\$12, 612, 430. 00
Hungry Horse.....	1, 012, 277, 000	3, 816, 000. 00
Yakima.....	118, 155, 644	326, 000. 00
Total.....	11, 324, 466, 230	16, 754, 430. 00

³ Includes systems of Riverton, Shoshone, Colorado-Big Thompson, and Kendrick projects.

Hydroelectric powerplants which are now an additional source of energy as a result of water conservation works had the following nameplate capacity installed during the year:

	Kilowatts
Colorado-Big Thompson project, Big Thompson powerplant.....	4,500
Missouri River Basin project, Glendo powerplant.....	24,000
Weber Basin project, Gateway powerplant.....	4,275
Weber Basin project, Wanship powerplant.....	1,425
Yakima project, Roza division, Roza powerplant.....	11,250

Additional Capacity Under Construction

At the end of fiscal year 1959, the Bureau of Reclamation had under construction 6 powerplants, which will have an ultimate installed nameplate capacity of 1,085,500 kilowatts:

Plant	Project	River	State	Nameplate capacity (kw.)
Upper Molina.....	Collbran.....	Colorado.....	Colorado.....	8, 640
Lower Molina.....	do.....	do.....	do.....	4, 860
Glen Canyon.....	Colorado River Storage.....	do.....	Arizona.....	900, 000
Flaming Gorge.....	do.....	Green.....	Utah.....	108, 000
Fremont Canyon.....	Missouri River Basin.....	North Platte.....	Wyoming.....	48, 000
Green Springs.....	Rogue River Basin.....	Emigrant Creek.....	Oregon.....	16, 000

The Corps of Engineers is proceeding with the construction of its plants in the Missouri River Basin project. The ultimate installed

nameplate capacity of Oahe Powerplant in South Dakota will be 595,000 kilowatts. The Bureau of Reclamation will be the marketing agent for energy generated by this plant, as is the case for other Corps plants on the Missouri River Basin project.

Hydroelectric Powerplants

The hydroelectric powerplants constructed and operated, under construction and authorized to be constructed by the Bureau of Reclamation and powerplants for which the Bureau is the marketing agent are listed in table 11.

TABLE 11.—*Hydroelectric powerplants*

A. CONSTRUCTED AND OPERATED BY BUREAU OF RECLAMATION

State	Project	Name of plant	Calendar year of initial operation	Nameplate rating	
				Existing (kilowatts)	Ultimate (kilowatts)
1. Alaska.....	Eklutna.....	Eklutna.....	1955	30, 000	30, 000
2. Alaska.....	do.....	Old Eklutna ¹		2, 000	2, 000
3. Arizona-Nevada.....	Boulder Canyon.....	Hoover ²	1936	1, 249, 800	1, 344, 800
4. Arizona.....	Parker-Davis.....	Davis.....	1951	225, 000	225, 000
5. California.....	do.....	Parker.....	1942	120, 000	120, 000
6. California.....	Central Valley.....	Folsom.....	1955	162, 000	162, 000
7. California.....	do.....	Keswick.....	1949	75, 000	75, 000
8. California.....	do.....	Nimbus.....	1955	13, 500	13, 500
9. California.....	do.....	Shasta.....	1944	379, 000	379, 000
10. California.....	Yuma.....	Siphon Drop.....	1926	1, 600	1, 600
11. Colorado.....	Colorado-Big Thompson.....	Big Thompson.....	1959	4, 500	4, 500
12. Colorado.....	do.....	Estes.....	1950	45, 000	45, 000
13. Colorado.....	do.....	Flatiron.....	1954	71, 500	71, 500
14. Colorado.....	do.....	Green Mountain.....	1943	21, 600	21, 600
15. Colorado.....	do.....	Marys Lake.....	1951	8, 100	8, 100
16. Colorado.....	do.....	Polehill.....	1954	33, 250	33, 250
17. Colorado.....	Grand Valley.....	Grand Valley ³	1933	3, 000	3, 000
18. Idaho.....	Boise.....	Anderson Ranch.....	1950	27, 000	40, 500
19. Idaho.....	do.....	Black Canyon.....	1925	8, 000	8, 000
20. Idaho.....	do.....	Boise Diversion.....	1912	1, 500	1, 500
21. Idaho.....	Minidoka.....	Minidoka.....	1909	13, 400	13, 400
22. Idaho.....	Palisades.....	Palisades.....	1957	114, 000	114, 000
23. Montana.....	Missouri River Basin.....	Canyon Ferry.....	1953	50, 000	50, 000
24. Montana.....	Hungry Horse.....	Hungry Horse.....	1952	285, 000	285, 000
25. New Mexico.....	Rio Grande.....	Elephant Butte.....	1940	24, 300	24, 300
26. South Dakota.....	Missouri River Basin.....	Angostura.....	1951	1, 200	1, 200
27. Utah.....	Provo River.....	Deer Creek.....	1958	4, 950	4, 950
28. Utah.....	Weber Basin.....	Gateway.....	1958	4, 275	4, 275
29. Utah.....	do.....	Wanship.....	1958	1, 425	1, 425
30. Washington.....	Columbia Basin.....	Grand Coulee.....	1941	1, 974, 000	1, 974, 000
31. Washington.....	Yakima.....	Chandler.....	1956	12, 000	12, 000
32. Washington.....	do.....	Roza.....	1958	11, 250	11, 250
33. Wyoming.....	Missouri River Basin.....	Glendo.....	1958	24, 000	24, 000
34. Wyoming.....	Kendrick.....	Alcova.....	1955	36, 000	36, 000
35. Wyoming.....	do.....	Seminole.....	1939	32, 400	32, 400
36. Wyoming.....	Missouri River Basin.....	Boysen.....	1952	15, 000	15, 000
37. Wyoming.....	do.....	Kortes.....	1950	36, 000	36, 000
38. Wyoming.....	North Platte.....	Guernsey.....	1927	4, 800	4, 800
39. Wyoming.....	Riverton.....	Pilot Butte.....	1925	1, 600	1, 600
40. Wyoming.....	Shoshone.....	Heart Mountain.....	1948	5, 000	5, 000
41. Wyoming.....	do.....	Shoshone.....	1922	5, 600	5, 600
Subtotal A.....				5, 137, 550	5, 246, 050

¹ Acquired from City of Anchorage on completion of Eklutna project fiscal year 1955. This plant is not being operated and has been declared surplus.

² Power plant units operated by Southern California Edison Co. and city of Los Angeles, Department of Water and Power as agents of the United States.

³ Leased to Public Service Co. of Colorado for operation.

U. S. C. E.—United States Corps of Engineers

I. B. W. C.—International Boundary and Water Commission

TABLE 11.—*Hydroelectric powerplants*—Continued

B. CONSTRUCTED AND OPERATED BY OTHERS—POWER MARKETED BY U. S. B. R.

State	Project	Name of plant	Calendar year of initial operation	Nameplate rating	
				Existing (kilowatts)	Ultimate (kilowatts)
1. Montana.....	Missouri River Basin (USCE)	Fort Peck.....	1943	85,000	165,000
2. North Dakota.....	do.....	Garrison.....	1956	240,000	400,000
3. South Dakota.....	do.....	Fort Randall.....	1954	320,000	320,000
4. South Dakota.....	do.....	Gavins Point.....	1956	100,000	100,000
5. Texas.....	Falcon (IBWC)	Falcon.....	1954	31,500	42,000
Subtotal B.....				776,500	1,027,000

C. UNDER CONSTRUCTION BY BUREAU OF RECLAMATION

1. Arizona.....	Colorado River Storage.....	Glen Canyon.....	1964		900,000
2. Colorado.....	Collbran.....	Upper Molina.....	1961		8,640
3. Colorado.....	do.....	Lower Molina.....	1961		4,860
4. Oregon.....	Rogue River Basin.....	Green Springs.....	1959		16,000
5. Utah.....	Colorado River Storage.....	Flaming Forge.....	1963		108,000
6. Wyoming.....	Missouri River Basin.....	Fremont Canyon.....	1960		48,000
Subtotal C.....					1,085,500

D. UNDER CONSTRUCTION BY OTHERS—POWER TO BE MARKETED BY U. S. B. R.

1. South Dakota.....	Missouri River Basin (USCE)	Oahe.....	1962		595,000
Subtotal D.....					595,000

Transmission System

To provide electrical energy for Bureau projects and to market power surplus to its needs, a transmission system including power-plant substations, switchyards, and transmission lines, has been constructed. During the year, approximately 76 circuit miles of transmission lines were completed, resulting in a total system of 9,992 circuit miles of line. As of June 30, the installed transformer capacity of the individual substations operated by the Bureau was 11,145,108 kilovolt-amperes.

The transmission lines completed in fiscal year 1959 are shown in Table 12.

TABLE 12.—*Transmission lines completed during fiscal year 1959*

Project and line	Voltage (kilovolts)	In-service date	Circuit miles
Eklutna project: Eklutna Powerplant to Palmer ¹	115	September 1958.....	9.00
Weber Basin project:			
Gateway Powerplant to Utah Power & Light Co. line.....	44	December 1958.....	.02
Wanship Powerplant to Utah Power & Light Co. line.....	44	August 1958.....	.30
Missouri River Basin project: Utica Junction to Sioux Falls.....	230	March 1959.....	66.84

¹ Relocation of 6 mile section from Eklutna Powerplant to Matanuska. Total length of line from Eklutna powerplant to Palmer substation is now 12.5 miles.

During the year, 90 contracts were executed for sale of power, transmission service, or for other purposes, as follows:

<i>Number of contracts:</i>	<i>Types of customer</i>
24-----	Private utilities
27-----	REA cooperatives
22-----	Municipalities
7-----	Federal agencies
5-----	State agencies
1-----	Irrigation district
4-----	Miscellaneous type contracts

A number of the contracts executed were renewals of operating contracts or revisions of existing contracts resulting from changed operating conditions.

The Bureau continued its policy of contracting whenever possible with private utilities, public bodies and cooperatives for wheeling power and energy over existing facilities. The Bureau also entered into several interchange agreements with its customers.

Customers served by Reclamation during fiscal year 1959 are summarized in table 13.

The Bureau at year's end had 85 contracts under active negotiation. In this number are included 18 contracts with private utilities, 26 with REA Cooperatives, 33 with municipalities, 3 with other Federal agencies, 3 with State Authorities, 1 with an irrigation district and 1 miscellaneous type contract. A number of these are to renew the existing contracts or to revise contracts in existence because of changes in operating conditions.

TABLE 13.—*Summary by classification of customers for 12 months ending June 30, 1959*¹

	Number of customers	Sales of electric energy, kilowatt-hours	Revenues from sales
Privately owned utilities.....	33	3, 828, 647, 673	\$12, 727, 118. 03
Municipal utilities.....	106	1, 995, 252, 318	7, 824, 863. 42
State Government utilities.....	13	4, 154, 294, 063	14, 506, 633. 60
Cooperative utilities (Rural Electrification Administration projects).....	84	2, 220, 150, 854	11, 472, 432. 62
Other Federal utilities ²	6	11, 396, 866, 713	17, 064, 942. 58
Residential and domestic.....	320	6, 040, 922	32, 408. 01
Rural (other than Rural Electrification Administration projects).....	7	176, 380	1, 163. 16
Commercial and industrial.....	19	98, 753, 695	500, 804. 14
Public authorities.....	83	1, 799, 751, 090	5, 557, 930. 31
Interdepartmental.....	44	1, 004, 326, 705	1, 280, 116. 15
Total all customers.....	715	26, 504, 260, 413	70, 968, 412. 02

¹ Does not include energy sales and revenues in transactions between Bureau projects.

² Totals include 11,324,466,230 kilowatt-hours delivered to Bonneville Power Administration for marketing and \$16,754,430.00 in payments by that agency.

Project Development

The project development program involves preparation of comprehensive plans for development of river basin resources and the investigation and planning of potential projects to meet the requirements of the fast-growing population of the West for optimum utilization and conservation of its limited water resources. The program also includes detailed preconstruction studies on newly authorized projects.

Comprehensive Basin Surveys

During the year, the Bureau, in cooperation with other agencies, was engaged in comprehensive surveys in 10 river basins throughout the West. In addition, comprehensive studies were active in 12 subbasins of the Missouri River Basin project. Miscellaneous general studies were essentially completed in many of these subbasins such as the South Dakota Pumping Division, the Three Forks Division in Montana and the White Division in South Dakota and Nebraska.

Project Planning Reports

By the end of the year project planning reports had been submitted to Congress on Vale project, Bully Creek Extension, Oregon; Wichita project, Cheney Division, Kansas; Gray Reef Dam and Reservoir, Glendo Unit, Missouri River Basin project, Wyoming; and La Feria Division, Lower Rio Grande Rehabilitation project, Texas. Processing of the Secretary's certification and accompanying economic justification report on the Curecanti Unit, Colorado River Storage project, Colorado, was essentially completed. Assistance was also rendered to the Bureau of the Budget for reports submitted previously on the Garrison Diversion Unit of the Missouri River Basin project and on the coordinated report of the Bureau of Reclamation and the Department of the Interior's Bureau of Indian Affairs on the San Juan-Chama and Navajo Irrigation projects. A planning report on Mann Creek project, Idaho, was transmitted to interested States and Federal agencies for review prior to submission to the Bureau of the Budget.

Definite Plans

During the fiscal year definite plans for authorized projects were completed on the Mercedes Division, Lower Rio Grande Rehabilita-

tion project, Texas; the Fort Cobb Division, Washita Basin project, Oklahoma, Volume I; the Cedar Bluff Unit, Missouri River Basin project, Kansas; the Crooked River project, Oregon; and on the Hammond project, New Mexico, the Smith Fork project, Colorado and the Seedskadee project, Wyoming, all participating projects of the Colorado River Storage project.

Alaska

Investigations continued under the permanently authorized investigations program of the Bureau in Alaska. A planning report on the Snettisham project was essentially completed.

Loan Program

Congress appropriated \$14,497,000 for six loans under the Small Reclamation Projects Act of 1956. Construction was initiated on four of these during the year. These are the first projects to be started under the provisions of this act. Repayment contracts were executed for the other two and funds are available for use when the contracts are validated by the courts. Five other small project applications were approved and forwarded to the Congress, while three more were approved by the Secretary but had not yet been forwarded to Congress by June 30. These last eight approved applications represent loans totaling \$16,032,000. Additional applications were received and are under consideration.

Three distribution system loan applications (Public Law 130, 83d Cong.) were approved. On one of these, however, the local voters did not approve the repayment contract. The other two completed all requirements including the required local approvals. The repayment contracts are ready for execution on behalf of the United States when funds become available.

River Compacts

The act granting the consent of Congress to the negotiations of the Niobrara River Compact by the States of Nebraska, Wyoming, and South Dakota, approved August 5, 1953, was amended by extending the time for such negotiations from 5 years to 8 years.

A bill was introduced granting the consent of Congress to the States of Kansas and Nebraska to negotiate and enter into a compact

relating to the apportionment of the waters of the Big Blue River and its tributaries as they affect such States.

The Bureau rendered technical assistance in inter-State compact negotiations between California and Nevada on the Lahontan Basin.

Hydrology

The Hydrology Branch continued its study of hydrologic problems associated with operating and proposed Reclamation projects. In all multiple-purpose reservoirs and coordinated systems, studies are made to develop operational criteria to attain optimum benefits from the standpoint of irrigation, flood control, hydropower, recreation, fish and wildlife resources, and sediment control.

Channelization investigations were conducted on the James, Middle Rio Grande, and Lower Colorado Rivers. Water salvage is a major aim of the Pecos, Middle Gila, Middle Rio Grande and Lower Colorado plans.

Cooperative work with the Department's Geological Survey was initiated on the measurement of water use by salt cedars in the Salt River Valley of Arizona. Contacts with various Federal, State, and local agencies were maintained on a program to determine the extent of phreatophyte infestation and growth habits, and its nonbeneficial consumptive use of water.

A basinwide hydrometeorological study of probable storms for aid in spillway design for the Central Utah project area was prepared. A similar basinwide study was initiated for the eastern slopes of the Sierra Nevadas.

Cooperative investigations of the effects of land treatment and conservation practices on yield of stream flow were conducted with the Agricultural Research Service and Soil Conservation Service.

International Streams Investigations

The Bureau of Reclamation is represented on two International Engineering Boards of the International Joint Commission. The Souris-Red Rivers Engineering Board continued the systematic collection and study of hydrologic data and related flood control and irrigation investigations in the Souris, Red, and Missouri River Basins. The Board also assisted the Commission, as requested, in connection with engineering aspects of the interim measures for apportionment of the waters of the Souris River between the United States and Canada. During the year the Waterton-Belly Rivers Engineering Board was inactive.

Contracts and Property Management

Reclamation purchases of equipment, supplies and services totaled \$14,400,000 during the year. Of the purchases from commercial sources (\$11,300,000), nearly one-half (\$5,200,000) were from small business firms. Four hundred and fifty-four construction contract awards totaled \$66,500,000. Of this amount, \$63,500,000 represented 242 major construction contracts; the balance consisted of relocation contracts and minor construction work.

Several changes were made in contract provisions aimed at eliminating contractor claims, litigation, and misunderstandings. A policy was adopted of providing railroads with a uniform type of liability insurance protection where Bureau construction crosses or involves railroad property. An increase from \$500 to \$2,500 in the open market purchase limitation, pursuant to Public Law 85-800, was authorized for field offices, resulting in improved efficiency and simplification. New simplified contract forms were adopted for construction contracts under \$10,000. Procedures were established for applying the Small Business Act and the Buy American Act to construction contracts. Division personnel were active on several inter-agency committees under General Services Administration sponsorship dealing with contracting and procurement problems. The major portion of the Bureau's Reclamation Instructions covering contracting and procurement was completed during the year.

Real property inventory data covering approximately 9,500,000 acres of land, 3,800 houses and other miscellaneous buildings, structures, and facilities valued at approximately \$2,670,000,000 were converted to a punchcard system for automatic data processing, to facilitate internal reporting, control, and management.

Real property with an acquisition cost of \$791,000 was disposed of during the year. Of this total, property with an acquisition cost of \$644,000 was returned to the tax rolls through sales to the general public.

Disposal of personal property with an acquisition cost of \$1,125,804 was accomplished during the year.

The Bureau prohibited use of carbon tetrachloride fire extinguishers in motorized equipment and buildings, eliminating danger to fire fighting personnel.

Revised Reclamation Instructions on Property Management have been completed for printing and issuance. It is contemplated that operating efficiencies will result.

Use of the National Credit Card for service station purchase of petroleum and other products was studied and adopted on a Bureau-wide integrated basis.

A study of storehouse facilities, staffing and work load was initiated for the purpose of improving efficiency and economy. Studies on the care, retention and disposition of some 136,000 cubic feet of drill cores was initiated.

Initial steps were taken toward increased utilization of Department of Defense excess personal property.

Program Coordination and Finance

Systems were improved to enable quick compilations of annual and long-range fund requirements on new Bureau projects being considered by the Department, the Congress, or others for early construction. The objective of the compilations is to illustrate directly the effect proposed new starts have on the Bureau's annual appropriation requirements in the future.

Procedures to provide information on significant changes which have occurred in budget data from similar data previously presented to the Congress were clarified and improved.

Existing program control procedures continued to be effective and sufficiently sensitive. A number of fund adjustments were accomplished during the fiscal year which improved overall Bureau performance.

Construction schedule procedures were revised to develop more detail and better scheduling of construction service facilities.

Finance

Regional office committees were given permanent status and will review on a continuing basis the application of automatic and electronic data processing methods to accounting and other administrative operations of the Bureau. An Electronic Data Processing Section was established in the Office of the Assistant Commissioner and Chief Engineer, Denver, Colo., to coordinate all phases of the Bureau's data processing program. One regional office and the Columbia Basin project office were authorized to lease punchcard equipment and small electronic computers. Such accounting operations as payroll, labor cost distribution, clearing accounts, allotment, distribution, plant and general ledgers will be processed on the installations. The small electronic computers will be used primarily for engineering computations.

A systems study of administrative applications is being performed in the Denver Office to determine the feasibility of and benefits to be derived from electronic computer processing. Selected field finance personnel participated in a Financial Management Institute in Washington, D.C., sponsored by the U.S. Civil Service Commission.

Budget

Appropriations made available to the Bureau of Reclamation for all purposes in fiscal 1959 totaled \$265,814,535. This amount includes \$10,237,200 appropriated in two supplemental appropriation acts, primarily for loans to local organizations for the construction of projects authorized under the Small Reclamation Projects Act of 1956 (Public Law 984). Also included was a small amount to cover pay raise costs. Permanent appropriations are not included. Appropriations for 1959 exceeded the funds made available in 1958 by \$65.8 millions. This increase was due primarily to normal acceleration in the program of the Colorado River Storage project and an increase in the fund requirements for the loan program.

With an unobligated balance of \$10.1 millions carried over from fiscal year 1958 for construction, investigations and the loan program, plus funds advanced by water users, trust funds, the continuing fund for emergency expenses, Fort Peck project and new appropriations, the total amount available to Reclamation was \$283.5 millions. Of this amount there remained unobligated at the close of 1959 from construction, investigations and the loan program, funds in the amount of \$17.7 millions. These funds are available in fiscal year 1960.

Obligations for 1959 totaled \$262.9, or 93 percent of the amount programed as compared to 96 percent of the program accomplished in 1958.

A new item was added to the Bureau's appropriation structure in 1959. For the first time funds were appropriated under the heading, "Loan Program" to implement provisions of Public Laws 984 and 130 of the 84th Congress, which authorized loans to local organizations for the construction of small irrigation projects and new distribution systems on existing Reclamation projects, respectively. Heretofore funds were made available for the Loan Program under "Construction and Rehabilitation."

Funds appropriated, by activity, for fiscal 1959, together with the amounts to be derived from the special and general funds are shown in table 14:

TABLE 14. *Condensed statement of appropriations, fiscal year 1959 exclusive of trust funds and permanent appropriations*

General Investigations	\$4,556,000	
Reclamation Fund	\$3,831,000	
Colorado River Development Fund	500,000	
General Fund	225,000	
Construction and Rehabilitation		146,015,000
Reclamation Fund	85,000,000	
General Fund	61,015,000	
Upper Colorado River Basin Fund		68,033,335
General Fund	68,033,335	
Operation and Maintenance		28,331,600
Reclamation Fund	23,083,483	
Colorado River Dam Fund	2,078,900	
General Fund	3,169,217	
Loan Program		14,497,000
General Fund	14,497,000	
General Administrative Expenses		4,381,600
Reclamation Fund	4,381,600	
Grand total	265,814,535	265,814,535
Reclamation Fund		116,296,083
Colorado River Dam Fund		2,078,900
Colorado River Development Fund		500,000
General Fund		146,939,552
		265,814,535

TABLE 15.—*The reclamation fund, fiscal years 1958-60, funds available for appropriation*

Receipts and appropriations	Actual 1958	Actual 1959	Estimated 1960
Unappropriated balance brought forward (as of June 30)	\$98,805,061	\$125,985,130	\$130,388,611
Accretions and collections:			
Bureau of reclamation and other agencies, 0.100	13,198,431	15,392,766	16,439,000
Other agencies, 0.200	46,972,771	46,517,273	53,678,800
Power revenues, 0.300	52,192,719	58,475,183	54,621,000
Subtotal, accretions and collections	112,363,921	120,385,222	124,738,800
Plus expired and lapsed appropriations	1,878,002	415,547	
Total available for appropriation	213,046,984	246,785,899	255,127,411
Less permanently authorized appropriations for:			
Refund of revenue collections		100,000	125,000
Farmers Irrigation District, North Platte project, Nebr.	3,109	8,000	8,000
Deduct annual appropriation or estimate for:			
General investigations	5,182,000	3,831,000	3,742,742
Construction and rehabilitation	55,000,000	85,000,000	95,000,000
Operation and maintenance	22,705,950	23,083,483	23,072,400
General administrative Expenses	4,170,795	14,374,805	4,290,000
Emergency fund			
Total annual appropriation or estimate	87,058,745	116,289,288	126,105,142
Total appropriations	87,061,854	116,397,288	126,238,142
Balance carried forward	125,985,130	130,388,611	128,889,269

TABLE 16.—*Accretions to reclamation fund by States, fiscal year 1959*

State	Sale of public land		Proceeds from Oil Leasing Act		Total to June 30, 1959
	Fiscal year 1959	To June 30, 1959	Fiscal year 1959	To June 30, 1959	
Alabama.....			\$1,435.49	\$215,324.06	\$215,324.06
Arizona.....	\$559,484.83	\$4,409,125.22	213,047.07	1,069,990.22	5,479,115.44
Arkansas.....			24,023.21	72,415.96	72,415.96
California.....	917,168.04	13,600,933.61	4,188,597.70	78,702,073.40	92,303,007.01
Colorado.....	262,780.15	11,931,062.83	5,245,234.94	47,130,163.17	59,061,226.00
Florida.....			301.74	3,205.39	3,205.39
Idaho.....	306,207.07	9,213,252.86	160,247.30	1,336,366.16	10,549,619.02
Illinois.....				74.81	74.81
Kansas.....		1,046,576.99	87,181.09	627,506.81	1,674,083.80
Louisiana.....			146,725.20	1,189,305.19	1,189,305.19
Michigan.....			1,129.51	32,812.48	32,812.48
Mississippi.....			3,111.14	26,748.69	26,748.69
Montana.....	126,244.58	16,748,842.73	2,260,486.61	17,124,732.16	33,873,574.89
Nebraska.....	921.60	2,220,722.17	5,398.05	82,279.59	2,303,001.76
Nevada.....	737,040.03	3,095,643.80	209,659.09	3,926,062.00	7,021,705.80
New Mexico.....	236,044.04	7,751,594.89	6,135,788.03	55,022,639.48	62,774,234.37
North Dakota.....	5,016.93	12,294,797.30	115,343.90	1,160,725.97	13,455,523.27
Oklahoma.....	64,747.11	6,044,805.06	30,006.17	317,066.83	6,361,871.89
Oregon.....	921,464.62	17,871,941.62	39,461.42	334,625.49	18,206,567.11
South Dakota.....	9,410.61	7,883,139.23	116,978.92	968,482.72	8,851,621.95
Utah.....	50,515.03	5,103,897.94	3,242,284.14	20,097,567.78	25,201,465.72
Washington.....	260,873.52	9,621,266.80	8,542.67	96,100.95	9,717,367.75
Wyoming.....	52,291.03	9,683,588.16	16,374,613.91	159,868,741.11	169,552,329.27
Total.....	4,510,209.19	138,521,191.21	38,609,597.30	389,405,010.42	527,926,201.63

Other accretions		Fiscal year 1959	Totals to June 30, 1959
Proceeds, Federal waterpower licenses.....		\$78,207.97	\$1,661,438.28
Proceeds, potassium royalties and rentals.....		3,339,902.80	18,495,734.76
Receipts from naval petroleum reserves, 1920-38, act of May 9, 1938.....			29,778,300.23
Proceeds from rights-of-way over withdrawn lands, act of July 19, 1919.....		553.35	13,460.85
Miscellaneous mineral leasing permits.....		70.00	317.25
Miscellaneous items, other.....			5.78
Total.....		3,418,734.12	49,949,257.15
Grand total.....		46,538,540.61	577,875,458.78

TABLE 17.—*Cost of plant, property and equipment in each State, June 30, 1959*

State and project	Completed works				Construction in progress	Other physical property	Grand total
	Multipurpose	Irrigation	Electric	Other plant			
Total, including loan program	\$1,208,018,553	\$1,009,560,840	\$672,142,338	1 \$28,745,676	\$391,589,838	\$20,837,375	1 \$3,330,994,600
Alaska: Eklutna			32,441,083		392,402		32,833,485
Arizona, subtotal	95,921,583	60,704,566	102,240,831	7,754,900	68,589,016	210,889	335,421,785
Boulder Canyon:	2,179,950						2,179,950
All-American Canal System (California)	44,552,890		33,615,648				78,168,538
Hoover Dam and Power plant (Nevada)							
Colorado River Front Work and Levee System (California-Nevada)				(F) 6,884,509	107,747		66,992,256
Colorado River Storage: Glen Canyon Unit (Utah)		44,802,514			66,475,494		66,475,494
Gila Verde (California)		514,992			1,542,511	210,889	46,555,914
Parker-Davis (California-Nevada)	44,109,531	10,731,853	64,236,842	(F) 870,391			1,385,383
Salt River	5,079,212	3,513,105	4,266,443		458,467		108,804,840
Yuma (California)			121,898				20,077,608
Yuma Auxiliary		1,142,102					3,635,003
Yuma Projects Office (California)					4,797		1,142,102
California, subtotal	379,764,917	211,775,831	122,036,271	16,270,102	114,234,525	13,237	1 \$34,094,883
Boulder Canyon: All-American Canal System (Arizona)				(F) 3,329,787			58,492,511
Cachuma	38,658,714	16,504,010			560,940	13,237	43,526,786
Central Valley	42,952,579				85,895,235		908,487,884
Colorado River Front Work and Levee System (Arizona-Nevada)	243,127,344	178,454,133	101,011,172	(F) 2,924,916			2,924,916
Klamath (Oregon)		6,615,142			247,655		6,862,797
Newlands (Nevada)		196,062					196,062
Oriand		2,583,870					2,803,325
Palo Verde (Arizona)		3,011,699		(F) 15,399	219,455		3,027,098
Parker-Davis (Arizona-Nevada)	6,187,962		20,536,710		74,997		26,799,669
Santa Maria	11,522,253						11,522,253
Solano	37,316,065				23,768		37,339,833
Truckee Storage (Nevada)		1,092,423					1,092,423
Ventura River					27,186,818		27,186,818
Washoe (Nevada)							
Yuma (Arizona)		3,318,492	488,389				3,806,881
Yuma Projects Office (Arizona)					25,657		25,657

TABLE 17.—*Cost of plant, property and equipment in each State, June 30, 1959—Continued*

State and project	Completed works				Construction in progress	Other physical property	Grand total
	Multipurpose	Irrigation	Electric	Other plant			
Colorado, subtotal.....	\$53,427,535	\$104,301,543	\$43,976,499	-----	\$7,154,735	\$6,009	\$208,866,321
Colbran.....	-----	-----	-----	-----	4,660,353	-----	4,560,353
Colorado-Big Thompson.....	36,288,545	80,372,580	42,981,004	-----	15,813	6,009	159,643,951
Colorado River Storage: Navajo Unit (New Mexico)	-----	-----	-----	-----	-----	-----	-----
Fruitgrowers Dam.....	-----	200,309	-----	-----	217,288	-----	200,309
Grand Valley.....	5,781,100	3,915,061	213,670	-----	795,479	-----	6,212,058
Manitou.....	13,289,470	-----	781,825	-----	1,564,206	-----	3,915,061
Missouri River Basin.....	-----	1,599,704	-----	-----	-----	-----	14,866,774
Poudre.....	-----	3,466,830	-----	-----	-----	-----	3,163,910
Pine River.....	-----	-----	-----	-----	1,596	-----	3,466,830
San Luis Valley.....	-----	-----	-----	-----	-----	-----	3,871,116
Uncompagire.....	3,869,520	8,965,959	-----	-----	-----	-----	8,965,959
Idaho, subtotal.....	86,686,478	52,043,754	23,688,711	\$1,020,096	8,847,717	27,978	172,324,734
Avondale.....	-----	244,424	-----	-----	-----	-----	244,424
Boise (Oregon).....	33,354,149	26,239,138	5,095,693	-----	1,267,676	-----	65,956,656
Dalton Gardens.....	-----	258,660	-----	-----	-----	-----	258,660
King Hill.....	-----	1,877,732	-----	-----	-----	-----	1,877,732
Lewiston Orchards.....	426,999	1,037,302	-----	(ND)1,020,096	-----	-----	2,494,397
Little Wood River.....	-----	-----	-----	-----	1,477,180	-----	1,477,180
Michaud Flats.....	-----	3,646,554	-----	-----	317,494	-----	3,964,048
Minidoka (Wyoming).....	8,719,792	16,274,922	3,116,182	-----	5,070,833	27,978	33,209,707
Owyhee (Oregon).....	-----	1,033,291	-----	-----	-----	-----	1,033,291
Palsades (Wyoming).....	44,195,538	-----	15,476,836	-----	710,526	-----	60,382,900
Preston Bench.....	-----	450,100	-----	-----	-----	-----	450,100
Rathdrum Prairie.....	-----	981,631	-----	-----	4,008	-----	985,639
Iowa:	-----	-----	-----	-----	-----	-----	-----
Missouri River Basin Transmission Lines.....	-----	-----	2,321,716	-----	853,309	-----	3,175,025
Kansas, subtotal.....	45,413,437	16,461,396	-----	-----	4,146,219	-----	66,021,052
Garden City.....	-----	334,475	-----	-----	-----	-----	334,475
Missouri River Basin.....	45,413,437	16,126,921	-----	-----	4,146,219	-----	65,686,577
Minnesota:	-----	-----	-----	-----	-----	-----	-----
Missouri River Basin Transmission Lines.....	-----	-----	3,487,426	-----	4,456,013	-----	7,943,439

Montana, subtotal.....	128, 160, 106	33, 099, 548	41, 786, 743	3, 358	9, 961, 244	325, 285	213, 336, 284
Bitter Root.....		1, 052, 873			154, 833		1, 207, 706
Buffalo Rapids.....		4, 927, 832			63, 588		4, 991, 420
Fort Peck (North Dakota).....			10, 630, 278		1, 755, 882		12, 386, 160
Frenchtown.....		279, 321				6, 449	279, 321
Hungry Horse.....	79, 356, 106		22, 178, 255		148, 303		101, 689, 113
Huntley.....		1, 829, 328				90, 491	1, 919, 819
Intake.....		94, 213					94, 213
Lower Yellowstone (North Dakota).....		3, 031, 353			65, 850		3, 031, 353
Milk River.....	2, 001, 917	7, 424, 992					9, 492, 759
Missoula Valley.....		278, 321			7, 769, 940	228, 345	278, 321
Missouri River Basin.....	46, 802, 083	3, 942, 801	8, 978, 210	(FW) 3, 358			67, 724, 737
Shoshone (Wyoming).....		16, 400			2, 848		16, 400
Sun River.....		10, 222, 114					10, 224, 962
Nebraska, subtotal.....	37, 081, 183	52, 384, 844	7, 609, 434		9, 445, 143		106, 520, 604
Mirage Flats.....		3, 061, 614					3, 061, 614
Missouri River Basin.....	37, 081, 183	39, 592, 955	7, 358, 766		9, 444, 998		93, 477, 902
North Platte (Wyoming).....		9, 730, 275	250, 668		145		9, 981, 088
Nevada, subtotal.....	49, 919, 065	8, 599, 589	38, 031, 146		642, 231	7, 492, 377	104, 084, 408
Boulder Canyon: Hoover Dam and Powerplant (Arizona) Boulder City Municipal Colorado River Front Work and Levee System (California-Arizona) Humboldt..... Newlands (California) Parker-Davis (Arizona-California) Truckee Storage (California) Washoe (California)	49, 919, 065		32, 123, 184		296, 335	1, 710, 803 5, 746, 614	84, 049, 387 5, 746, 614
New Mexico, subtotal.....	17, 045, 839	39, 945, 855	8, 037, 163	272, 927	336, 983		336, 983
Carlsbad.....					19, 886, 689		85, 188, 473
Colorado River Storage: Navajo Unit (Colorado)	3, 179, 992	2, 059, 600					5, 239, 592
Fort Sumner.....		2, 372, 069			9, 119, 676		9, 119, 676
Hondo.....		339, 377					2, 372, 069
McMillan Delta.....							339, 377
Middle Rio Grande.....	4, 300, 433	12, 591, 279			215, 504		215, 504
Rio Grande (Texas).....	8, 166, 940	6, 019, 826	8, 037, 163	(F) 272, 927	10, 259, 306		27, 151, 018
Tucumcari.....		15, 474, 082			280, 203		22, 777, 059
Vermejo.....	1, 398, 474	1, 089, 622			12, 000		15, 474, 082

TABLE 17.—Cost of plant, property and equipment in each State, June 30, 1959—Continued

State and project	Completed works				Construction in progress	Other physical property	Grand total
	Multipurpose	Irrigation	Electric	Other plant			
North Dakota, subtotal.....	\$8,393,268	\$3,407,941	\$30,694,818	\$41,558	\$4,988,863	\$199,652	\$47,726,100
Buford-Trenton.....		1,080,968			53,593		1,134,561
Buford-Trenton (old).....		223,423					223,423
Fort Peck (Montana).....			1,548,980		7,701		1,556,681
Lower Yellowstone (Montana).....		554,574					554,574
Missouri River Basin.....	8,393,268	1,139,881	29,145,838	(FW)41,558	4,927,569	199,652	43,847,766
Williston.....		409,095					409,095
Oklahoma, subtotal.....	6,958,533	5,136,166		152,026	11,200,086		23,446,811
W. C. Austin.....	6,958,533	5,136,166		(M)152,026			12,246,725
Washita Basin.....					11,200,086		11,200,086
Oregon, subtotal.....	34,303	50,640,901	607,269		19,827,167	13,332	71,122,972
Arnold ?.....					2,252		2,252
Baker.....		225,015					225,015
Boise (Idaho).....		4,275					4,275
Burnt River.....		601,026					601,026
Crescent Lake Dam.....		319,936					319,936
Crooked River (includes Ochoco).....		12,898,721	447,366		2,513,278		2,960,644
Deschutes.....			67,938				12,966,659
Grants Pass-Savage Rapids Dam ?.....		8,039,634	91,965			13,332	8,144,931
Klamath (California).....							
Ochoco (See Crooked River).....		18,285,942			12,057		18,297,999
Owyhee (Idaho).....		216,535			16,932,399		17,148,934
Rogue River.....	34,303	5,182,993			15,301		5,198,294
Umatilla.....		4,866,824					4,866,824
Vale.....					351,880		351,880
Wapinitia, Juniper Division.....							
South Dakota, subtotal.....	25,391,180	9,139,255	43,294,173	36,070	5,294,633	54,495	83,209,806
Belle Fourche.....		5,038,107					5,038,107
Missouri River Basin.....	24,470,956	4,101,148	43,294,173	(FW)36,070	5,294,633	54,495	77,251,475
Rapid Valley.....	920,224						920,224
Texas, subtotal.....	23,439,644	5,023,208			760,956		29,223,808
Balmorhea.....							
Colorado River.....		406,533					406,533
Falcon.....	23,439,644						23,439,644
Lower Rio Grande, Mercedes.....					216,781		216,781

Rio Grande (New Mexico)					4,616,675				20,457	4,637,132
San Angelo									523,718	523,718
Utah, subtotal					18,667,566	1,164,796	12,868,751	31,886,458	61,085	95,533,572
Central Utah, Vernal Unit										
Colorado River Storage:										
Glen Canyon Unit (Arizona)										
Flaming Gorge Unit (Wyoming)										
Transmission Division										
Hyrum					953,854					6,792,981
Moon Lake					1,799,859					458,227
Newton					712,592					953,854
Ogden River					5,000,984					1,799,859
Provo River					3,710,321	1,072,992	(M)12,868,751	149,929		5,150,913
Sanpete					433,940			665,909		33,969,467
Scofield										433,940
Strawberry Valley					943,837					943,837
Weber Basin					3,332,530	91,804				3,485,419
Weber River					2,723,486			22,744,442	61,085	37,034,027
Washington, subtotal					270,966,800	112,873,613	325,888	37,342,992	10,179,141	593,253,993
Chief Joseph Dam, Foster Creek										2,473,212
Columbia Basin					2,445,363			27,849		527,900,089
Okanogan					221,209,820	107,631,935		36,993,904	10,179,141	1,519,034
Yakima					1,498,251		(FW)325,888	20,783		61,361,658
					45,813,366	5,241,678		300,456		
Wyoming, subtotal					67,262,077	57,830,646		27,026,682	949,973	211,010,365
Colorado River Storage: Flaming Gorge Unit (Utah)										
Eden					7,053,908			707,937		7,761,845
Kendrick					10,167,642	15,581,957		7,440		30,921,395
Minidoka (Idaho)					2,246,462					2,246,462
Missouri River Basin					45,651,879	37,082,089		24,300,200	800	109,677,348
North Platte (Nebraska)					1,768,305	1,294,637		105,275		13,815,888
Pallisades (Idaho)					841,193					841,193
Riverton					2,935,169	480,623		791,271	949,173	23,234,382
Shoshone (Montana)					1,560,085	3,411,340		1,114,559		22,511,852
Nonproject property								85,764	1,403,922	1,489,686
Subtotal					1,208,018,533	672,142,338	128,745,676	387,022,844	20,937,375	13,326,427,606
Loan program								4,566,994		4,566,994
Total, including loan program					1,208,018,533	672,142,338	128,745,676	391,589,838	20,937,375	13,330,994,600

¹ Excludes San Diego \$30,532,659 transferred from the Navy Department for administration of repayment contract.

² Construction costs classified as funded operation and maintenance charges.

NOTES.—Name of State in which balance of project is located is indicated by parentheses (except Missouri River Basin, located in 10 States). Irrigation plant is listed at gross construction cost prior to deduction of charge-offs authorized by Congress. Municipal and industrial water plant (M) totals \$14,040,873; flood control plant (F) totals \$14,297,929 and fish and wildlife (FW) totals \$406,874.

Statistics

Legislative references on project authorizations and related items, together with financial and employment statistics on Bureau operations and those reflecting physical progress and program accomplishments on all Bureau activities were kept up to date.

To supplement the Bureau's publications on Reclamation Laws, Project Feasibilities and Authorizations, Appropriation Acts and Allotments and Repayments—of which new editions are published periodically—the time series of statistical data published in this report annually 1902 through 1957 and since omitted, are now being published in the Statistical Appendix to this report for use within and outside of the Government. A new edition of Reclamation Appropriation Acts and Allotments for publication in 1960 and expansion of the Statistical Appendix to include individual data sheets on each project, were undertaken. Under the program of continuing research to establish and refine important historical data, those on allotments made to Missouri River Basin Project, by activity, by units, and by years were completed. Trend and forecast studies on financial and employment matters such as potential ultimate financing of Reclamation programs from its special funds receipt accounts, and staffing, were made for administrative purposes.

Physical progress and program accomplishments were evaluated monthly and published in the Bureau's Monthly Report on Progress and Status of Funds, and the Bureau's Quarterly "Progress" report, the summary data being included in the Statistical Appendix to this report. As an aid to financial management, the Forecast of Utilization of Investigations Funds and that for Operation and Maintenance Funds were initiated, supplementing the previously established Forecast of Utilization of Construction Funds. Trends and forecast studies on program expenditures for the current and budget year, special reports and chart presentations on programs, funds and employment and staff guidance within the Bureau on preparation and analysis of statistical data were continued.

Division of Foreign Activities

In recognition of the Bureau of Reclamation's reputation in the development of water resources and related technical and administrative fields, the governments of 35 countries have, during the past year, requested Bureau assistance through the aid programs of the U.S. Government and various international organizations. This requested assistance has consisted of (1) the training and development of foreign nations in the techniques, practices, and pro-

cedures of the Bureau of Reclamation, (2) the undertaking of laboratory studies, design review and other technical advice to agencies of foreign governments, and (3) the selection of Bureau employees to act as technical advisers, and to be part of actual work teams engaged in the training of foreign nationals and advising government bureaus in planning and construction of irrigation and power projects in other lands.

The Division of Foreign Activities is responsible for administering the Bureau's participation in these programs. Fulfillment of these requests is accomplished to the greatest extent possible without interference with the domestic program. All such assistance is financed from sources outside the regular Reclamation appropriation.

The past year has seen the Washington, Denver, Regional and Project Offices provide on-the-job training to 86 technicians and administrators from 33 countries, and 215 additional individuals have spent short periods of observation and consultation in various Bureau offices. These participants return home to staff the agencies responsible for the development of their country's resources to meet the steadily increasing demands for more food, more fiber, and more power. Many former "students" of this Reclamation training program are now in responsible positions in their homelands, and are leading figures behind their respective governments' resource development activities.

This export of technical knowledge also was accomplished by sending 23 Bureau employees to 12 countries to advise on problems of design, construction, land settlement, irrigation law, organization, and the preparation of technical manual material. In addition, 6 engineers were on extended assignments providing advisory services on construction projects in Taiwan and Australia, and a team of 9 was initiating a reconnaissance survey of the Blue Nile River Basin in Ethiopia. The work in Taiwan and Ethiopia is under auspices of the International Cooperation Administration, while the Australia assignments are arranged through the International Educational Exchange Service, under authority of Public Law 402, 80th Congress. In addition, the Assistant Commissioner and Chief Engineer's office in Denver has provided a variety of technical services, including laboratory tests, design review, advice on specific technical problems, and supply of numerous technical publications.

Organization and Management

Organization and management studies were continued. Of particular significance, the Department, at the request of the Bureau,

conducted a study of regions 6 and 7 in the Missouri River Basin and the Office of the Commissioner, Denver, Colo. The Bureau was represented in the survey team, which made 17 recommendations dealing with the organization, management, staffing, financing and budget activities of the Bureau. Local organization surveys also were performed by regional offices.

Offices were established as follows: Wenatchee Project Office, Wenatchee, Wash.; Little Wood Project Office, Carey, Idaho; El Dorado Distribution System Project Office, Placerville, Calif.; Lower Rio Grande Rehabilitation Project, Weslaco, Tex.; San Angelo Project Office, San Angelo, Tex.; Farwell Project Office, St. Paul, Nebr.; Ainsworth Project Office, Ainsworth, Nebr.; Prosser Creek Field Division, near Truckee, Calif.; Vernal Field Division, Vernal, Utah; Collbran Field Division, Collbran, Colo.; and Paonia Field Division, Paonia, Colo. The following offices were closed: Santa Maria Project Office, Santa Maria, Calif.; Solano Project Office, Winters, Calif.; and Sargent Irrigation Operations Field Branch, Sargent, Nebr.

New portions were prepared for the Reclamation Instructions covering basic policies and procedures which govern Bureau activities. Contracts, procurement and property management received primary attention in the preparation of instructions and guidelines. A comprehensive index to the entire Reclamation Instructions system was distributed.

Problems were identified through the Management Improvement Program, and projects were scheduled to improve the performance of the Bureau's work. A forms review project was initiated to eliminate obsolete and rarely used forms. Special assignments of a varying nature increased, with considerable attention given to outside employment matters, and staffing analyses.

A total of 1,087 suggestions for the improvement of Bureau activities and procedures were received during the year. Approximately 35 percent of these were adopted and the employees proposing the improvements were awarded \$11,130. The adopted suggestions resulted in an estimated annual savings of \$97,328, in addition to substantial intangible benefits. Superior Performance cash awards were granted to 311 employees.

Personnel

The continued utilization of carefully planned staffing control resulted in a further decline in Bureau employment during fiscal year 1959. At the beginning of the year there were 10,125 full-time employees on the rolls; at the end of the year the figure was 9,717.

A surplus employee placement program enabled the Bureau to move many employees from areas with declining workloads to those of increasing activity. The decrease in the number of employees was accomplished systematically, mainly through attrition, and did not require extensive use of reduction-in-force procedures.

The passage of the Government Employees Training Act, early in fiscal year 1959, provided the Bureau with greater opportunities to promote efficiency, increase production, improve supervision, and better communications through greater emphasis on training activities. Following enactment of the legislation, a comprehensive review of the Bureau's training needs and requirements was conducted. The results of the survey and the authority granted by the Training Act were used as the basis for strengthening Bureau in-service training programs, for instituting new ones where a need was evident, and for increasing participation by employees at training programs in non-Government facilities.

The Bureau's new merit promotion program went into effect on January 1, 1959, in accordance with instructions of the Civil Service Commission. One promotion plan covers positions Bureauwide at grades GS-9 and above and provides for a centralized roster of qualifications information on employees at grades GS-12 and above. Promotion plans covering positions at GS-8 and below and wage board jobs were developed and are being administered on a decentralized basis.

An extensive college relations program, primarily designed for recruiting beginning engineers, was continued at colleges and universities during the year. Recruiting teams interviewed students at schools both inside and outside the reclamation area. The Bureau goal for hiring entrance level engineers was substantially realized.

Audit and Financial Review

Forty-five assignments were completed by the field staff during the fiscal year. They consisted of 34 comprehensive project audits; 1 financial audit of a water users' organization, made at its request; 9 special assignments; and assistance to a water users' organization in expansion of its accounting system to meet requirements under Small Projects Act loan agreement.

The Washington staff and the personnel of the Denver staff also provided, throughout the year, assistance on Bureau financial and accounting problems, including studies regarding electronic data processing machine applications. Additionally, one auditor was detailed to assist another agency of the Department in developing its audit program.

General Services

During the fiscal year the Bureau received and created 9,700 cubic feet of records; disposed of 10,900 cubic feet; transferred to Federal records centers and National Archives for custody and servicing 2,100 cubic feet; and transferred to other Government agencies, water users' organizations, etc., 59 cubic feet. These resulted in a decrease in volume of records held by all Bureau offices from 94,346 to 91,000 cubic feet.

In response to 1,004 requests, 15,405 copies of Bureau publications were distributed from our Washington office. Of these requests 140 were of congressional origin for 521 publications and 162 were from agencies of the executive branch of the Federal Government for 3,792 copies.

In response to 6,425 requests for the Bureau's publications and informational materials received from individuals in this country and in foreign countries, more than 33,000 copies of technical publications and informational pamphlets were sold or distributed from Denver. Sales of Bureau publications totalled \$23,202, approximately one-half of this total being made to foreign countries. Sales of publications sold for the Superintendent of Documents totaled \$4,630.

Three thousand one hundred twenty-seven photographic prints were provided for reproduction in Bureau publications, non-Government textbooks and encyclopedias, various agricultural and engineering magazines and newspapers, and to supplement exhibits and lectures. Requests by mail and in person for visual material were also received from congressional offices and from agencies of the executive branch of the Federal Government.

Eight hundred and thirty motion picture films were distributed to television stations, agricultural and engineering institutions, water users' associations, organizations of farmers, and to conventions in the United States and abroad.

Legal

During the fiscal year, which included approximately the last 2 months of the 2d session of the 85th Congress and the first 6 months of the 86th Congress, several legislative proposals of importance to the Bureau of Reclamation were enacted into law:

Of interest generally are:

Title III of Public Law 85-500, called the Water Supply Act of 1958, which authorizes the Bureau of Reclamation to include pro-

vision in any reservoir to be constructed by it for future municipal and industrial water requirements, the cost of such provision for future needs to be deferred until that supply is first used.

Public Law 85-611, which permits the use of variable repayment plans in existing and proposed repayment contracts under section 9(d) of the Reclamation Project Act of 1939 and repayment contracts under the Water Conservation and Utilization Act.

With respect to specific projects, the Congress enacted legislation authorizing the construction and operation of Gray Reef Dam and Reservoir as a feature of the Glendo unit, Wyoming, Missouri River Basin project (Public Law 85-695); amended the authorization of the Washoe project, Nevada, to increase the amounts which may be appropriated therefor (Public Law 85-706); approved the report on the feasibility of the Red Willow Dam and Reservoir, Nebraska (Public Law 85-789); authorized the transfer to the United States of necessary right-of-way for Yellowtail Dam and Reservoir, Missouri River Basin project, and the payment to the Crow Indian Tribe for such right-of-way (Public Law 85-523); and authorized, in connection with the construction of the Seedskaadee project, Wyoming, the acquisition of privately owned land in the project area, the disposal of that and other federally owned land in connection with a farm settlement program on the project, and the establishment of the maximum size of farm units in single ownership which may be served with project water (Public Law 85-797).

Authorization was granted to execute the repayment contract negotiated with the Heart Mountain Irrigation District, Wyoming (Public Law 85-889), and to amend the repayment contract with the Arch Hurley Conservancy District (Public Law 85-663).

Of special interest is the enactment of Public Law 85-900, which is designed to facilitate the early incorporation of Boulder City under the laws of the State of Nevada in order that the United States may withdraw from the administration of that community.

Litigation

1. *Rank v. Krug, et al.* The history of this case appears in the 1956 Annual Report of the Secretary, page 62. Supplemental information appears in the 1957 Annual Report, page 88, and the 1958 Annual Report, page 57. The United States and its codefendants (water-user organizations beneficiary to the operations of the Central Valley project, particularly as to the operations at Friant Dam and Friant-Kern and Madera Canals) have appealed the case to the Ninth Circuit Court of Appeals. The complete record on appeal has not yet reached the offices of the court of appeals.

2. *State of California v. United States*, District Court for the Northern District of California, No. 7264. The history of this action appears in the 1958 Annual Report of the Secretary, page 57. The case has not yet been set for trial.

3. *Citizens Utilities Company v. United States*, United States Court of Claims, No. 364-55. This action was filed in the Court of Claims September 30, 1955, for damages totaling \$12,216,775 alleged to have been sustained as a result of the wrongful and unlawful failure and refusal of the United States to renew its contract for purchase of Metropolitan Water District unused Hoover Dam energy, which contract by express terms of limitation had expired December 31, 1954. On March 6, 1957, the court of claims held in favor of the plaintiff. Request for rehearing was denied on June 5, 1957; a petition for writ of certiorari was denied by the United States Supreme Court on December 9, 1957.

Negotiations for the resumption of delivery of Metropolitan Water District unused energy to the Company were carried on after the denial of certiorari. Although agreement had not been reached on an arrangement which would dispose all issues, the Company was advised that the United States would be willing to resume deliveries of such energy on June 1, 1958, with the understanding that the respective positions of the Company and the United States would not be prejudiced thereby. The Company accepted this offer and delivery to it was resumed on June 1, 1958.

The Company filed its Schedule of Damages in February 1959.

4. *State of Arizona, Plaintiff v. State of California, et al.* No. 9 Original, Supreme Court of the United States. In this action Arizona is seeking a determination of its rights in and to the use of the waters of the Colorado River, as against such rights claimed by the defendants, under the Colorado River Compact, the Boulder Canvon Project Act, and the California Limitation Act. Trial of the case before Special Master Simon H. Rifkind was concluded in August 1958. Thereafter, proposed findings of fact and conclusions of law, and briefs were filed with the Special Master by all parties.

5. *The Ivanhoe Irrigation District v. All Parties and Persons, etc., and related cases.* The history of this case appears in the 1958 Annual Report of the Secretary at page 60. Late in 1958 a petition for rehearing and clarification was filed with the Supreme Court of California by attorneys representing the protesting landowners in the several districts. The petition raises questions, among other things, on the authority of the irrigation districts to enter into the contracts and the validity of election notices. The submission of briefs and presentation of oral arguments have been completed. No decision has been issued yet by the Court.

6. *J. W. Wheeler Co. v. Jean Lee Knight Tripp, Defendant and Third Party Plaintiff, and United States, Third Party Defendant.* The defendant's complaint against the additional defendant, United States, was filed in the United States District Court, W.D. Washington, Northern Division, Seattle, Wash., in May 1958, for the purpose of having a recordable contract on certain Columbia Basin Project land owned by the plaintiff declared a nullity because of the alleged failure of the United States to plat it as a farm unit and construct irrigation facilities to serve it under the recordable contract between the United States and the original landowner entered into in April 1946. The Court granted a motion to dismiss the United States from the case on jurisdictional grounds, and a motion for summary judgment in favor of the plaintiff upholding the recordable contract and allowing recovery of the excess consideration paid for the land in violation thereof.

Bonneville Power Administration

William A. Pearl, *Administrator*



GROSS REVENUES of the Department of the Interior's Bonneville Power Administration for the fiscal year 1959, pending final audit, were \$67,966,291, representing an increase of \$1,391,157, or 2.05 percent over the gross revenues for the previous year.

After providing for all expenses of operation, including maintenance, interest, depreciation and miscellaneous charges, the net deficit for 1959 was \$7,302,572 as compared with a net deficit of \$8,315,204 for 1958. The reduction of \$1,012,632 in the deficit was accounted for by the fact that revenues increased \$279,632 more than expenses, while the aggregate amount allocated to generating projects was reduced by \$733,000.

This net decrease of \$733,000 in allocations to generating projects resulted from the following principal factors:

1. The scheduled annual payout requirements for the McNary and The Dalles projects were reduced because changes in the tentative cost allocations decreased the amount of construction costs and operation and maintenance expenses allocated to power for those projects.

2. Revenues allocated in fiscal year 1958 were more than sufficient to meet some of the projects' payout requirements for that year. Therefore, in fiscal year 1959 the allocations of revenues to those projects were reduced to the normal payout requirements.

3. For some of the projects the allocations of revenues were increased because of the addition of more generating facilities.

4. Inasmuch as system revenues were insufficient after paying the operation and maintenance and interest expenses to meet the regularly scheduled amortization requirements for all of the projects and the BPA transmission system, the amounts of revenues allocated to the Bonneville Dam and McNary Dam projects were reduced. The system deficiency was prorated among these two projects and BPA

by the amounts required to absorb the deficiency inasmuch as each was substantially ahead of its scheduled payout requirements as of June 30, 1958. However, the amounts allocated to these two projects and BPA were sufficient to pay a portion of their scheduled amortization for 1959 and all three continued to be considerably ahead of their amortization schedules as of June 30, 1959.

Statement of Revenues and Expenses

Table I presents a condensed statement of revenues and expenses together with cumulative totals from inception of the Bonneville Power Administration to June 30, 1959. The operating revenues, the expenses for operation, maintenance, depreciation and interest, and the net revenues shown in this table are for the Bonneville Power Administration only and not for the Columbia River power system. Similarly, the data shown in tables II to V, inclusive, also apply to the Bonneville Power Administration only. The amounts shown in table I as allocated to the generating projects are applied in the accounts of those projects to the return of their expenses for operation, maintenance, and interest and to the repayment of construction costs.

Summary of Revenue

Table II summarizes revenues by class of customer by fiscal years to and including 1959. Industrial customers accounted for 39.47 percent of the revenue dollar for fiscal year 1959; the aluminum industry provided 24.44 percent and other industries 15.03 percent. Sales to publicly owned utilities were 37.71 percent of the total revenue for 1959, and sales to privately owned utilities were 20.44 percent. Other operating revenues amounted to 2.38 percent of the total for 1959.

TABLE I.—*Bonneville Power Administration—condensed comparative summary of revenues and expenses, fiscal years 1958 and 1959, and cumulative totals from inception to June 30, 1959 (preliminary)*

	Fiscal year 1958	Fiscal year 1959	Increase or (decrease)	Cumulative total to June 30, 1959
Operating revenues.....	\$66,575,134	\$67,966,291	\$1,391,157	\$663,044,075
Less amounts allocated to generating projects.....	45,475,000	44,742,000	(733,000)	356,127,320
Operating revenues allocated to BPA....	21,100,134	23,224,291	2,124,157	306,916,755
Expenses of operation, maintenance, etc.....	10,310,832	10,517,937	207,105	119,220,190
Provision for depreciation.....	11,606,270	11,934,218	327,948	97,841,445
Interest expense.....	7,498,236	8,074,708	576,472	65,799,646
Total deductions.....	29,415,338	30,526,863	1,111,525	282,861,281
Net revenues.....	(8,315,204)	(7,302,572)	1,012,632	24,055,474

TABLE II.—*Bonneville Power Administration—revenue by class of customer through fiscal year 1959 (preliminary)*

Class of customer	1954 and prior years	1955	1956	1957	1958	1959	Total to June 30, 1959	Percent distribution of 1959 total revenues
Industry:								
Aluminum.....	\$143,938,965	\$16,909,588	\$20,098,110	\$20,025,700	\$17,491,535	\$16,611,144	\$235,075,042	24.44
Other ¹	39,673,399	6,821,850	8,186,874	8,451,336	9,466,846	10,216,244	82,816,549	15.03
Publicly owned utilities.....	80,708,669	17,601,135	19,505,231	22,044,831	23,574,281	25,629,526	189,063,673	37.71
Privately owned utilities.....	77,393,420	9,926,150	11,999,475	14,450,108	14,171,346	13,892,865	141,833,364	20.44
Other operating revenue.....	7,705,440	719,332	1,044,307	1,298,730	1,871,126	1,616,512	14,255,447	2.38
Total operating revenues.....	349,419,893	51,978,055	60,833,997	66,270,705	66,575,134	67,966,291	663,044,075	100.00

¹ Includes sales to Federal agencies.TABLE III.—*Bonneville Power Administration—summary of Federal investment in transmission system and repayment as of June 30, 1959 (preliminary)*

	Gross investment	Repayments	Net investment
Investment in current expenses:			
Operation, maintenance, etc.....	\$100,321,402	\$100,321,402	-----
Interest.....	65,799,646	65,799,646	-----
Total current expenses.....	166,121,048	166,121,048	-----
Investment in capital assets:			
Electric plant investment and other capital assets.....	484,986,237	¹ 121,391,077	\$363,595,160
Unexpended appropriations.....	16,155,245		16,155,245
Total capital investment.....	501,141,482	121,391,077	379,750,405
Total Federal investment.....	667,262,530	287,512,125	379,750,405

¹ Consists of \$78,280,000 scheduled amortization and \$43,111,077 repaid in excess of scheduled requirements. The total repayment, \$121,391,077, equals 25 percent of the invested capital of \$484,986,237.TABLE IV.—*Bonneville Power Administration—condensed statement of assets and liabilities as of June 30, 1958 and 1959 (preliminary)*

	June 30, 1958	June 30, 1959	Increase or (decrease)
ASSETS			
Electric Plant—original cost.....	\$443,133,054	\$461,479,378	\$18,346,324
Less: Reserve for depreciation.....	74,298,048	86,051,373	11,753,325
Original cost less reserve.....	368,835,006	375,428,005	6,592,999
Current assets.....	30,242,500	31,594,790	1,352,290
Deferred charges, special funds, etc.....	3,338,451	2,789,135	(549,316)
Total assets.....	402,415,957	409,811,930	7,395,973
LIABILITIES AND OTHER CREDITS			
Net investment of the U.S. Government.....	361,965,702	379,750,405	17,784,703
Current liabilities.....	8,352,718	5,980,686	(2,372,032)
Reserves and other credits.....	739,491	25,365	(714,126)
Accumulated net revenues.....	31,358,046	24,055,474	(7,302,572)
Total liabilities and other credits.....	402,415,957	409,811,930	7,395,973

TABLE V.—*Bonneville Power Administration—sales of electric energy—firm and nonfirm by class of customer, fiscal years 1958 and 1959 (preliminary)*

[In thousands]

Class of customer	Fiscal year 1958	Fiscal year 1959	Amount of increase or (decrease)	Percent increase or (decrease)
Aluminum industry:				
Firm.....	\$13,980	\$14,227	\$247	1.77
Nonfirm.....	3,512	2,384	(1,128)	(32.12)
Total aluminum industry.....	17,492	16,611	(881)	(5.04)
Other industry:				
Firm.....	3,006	3,138	132	4.39
Nonfirm.....	407	675	268	65.85
Total other industry.....	3,413	3,813	400	11.73
Publicly owned utilities:				
Firm.....	22,593	24,861	2,268	10.04
Nonfirm.....	981	769	(212)	(21.61)
Total publicly owned utilities.....	23,574	25,630	2,056	8.72
Privately owned utilities:				
Firm.....	11,364	11,306	(58)	(.51)
Nonfirm.....	2,807	2,587	(220)	(7.84)
Total privately owned utilities.....	14,171	13,893	(278)	(1.96)
Federal agencies:				
Firm.....	5,860	6,015	155	2.64
Nonfirm.....	194	388	194	100.00
Total Federal agencies.....	6,054	6,403	349	5.76
Sales of electric energy:				
Firm.....	56,803	59,547	2,744	4.83
Nonfirm.....	7,901	6,803	(1,098)	(13.90)
Total sales of electric energy.....	64,704	66,350	1,646	2.54

Total energy sales increased in 1959 over 1958 by \$1,645,771. However, sales to the aluminum industry and to privately owned utilities decreased \$880,391 and \$278,481, respectively. Sales to other industries increased \$749,398 and to publicly owned utilities by \$2,055,245. Revenues from sources other than energy sales decreased \$254,614, with the result that total operating revenues gained only \$1,391,157.

Repayment of Federal Investment

The gross Federal investment in the transmission facilities operated by the Bonneville Power Administration is comprised of the total of all funds appropriated for the construction, operation and maintenance of the transmission system, together with WPA expenditures and net amounts transferred from other Federal agencies, plus interest at the rate of 2½ percent per annum on the unpaid balance.



Bonneville-Grand Coulee 230,000-volt transmission lines top a rock escarpment as they feed power into BPA's high voltage integrated transmission grid.

As of June 30, 1959, the investment in transmission facilities and expenses amounted to \$667,262,530. Repayments in the amount of \$287,512,125 have been made, leaving an unpaid balance of \$379,750,405. Table III presents a summary of the amount and repayment of the Federal investment in the BPA transmission program. As of June 30, 1959, repayment of the capital investment was \$43,111,077 ahead of schedule.

Comparative Balance Sheet

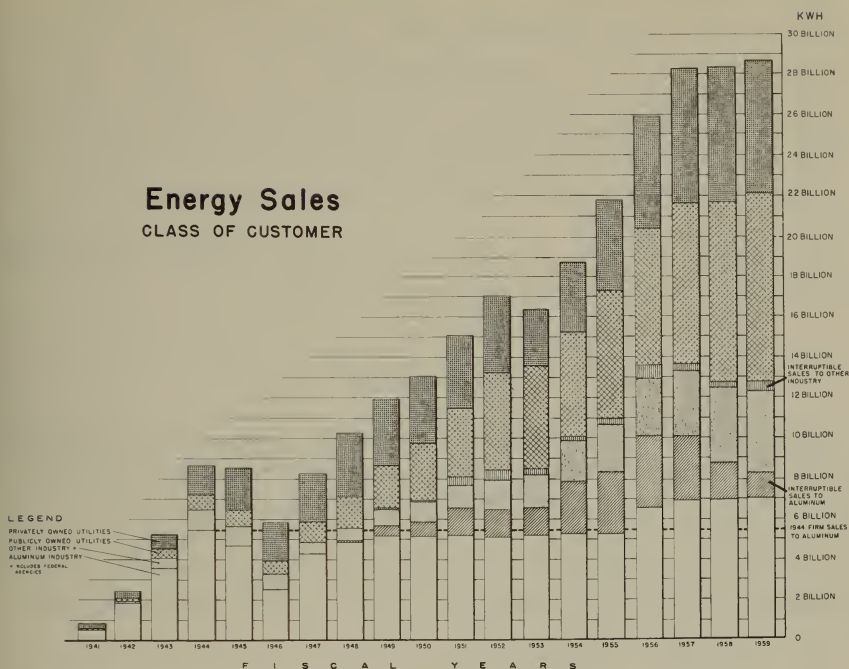
Table IV presents a comparative condensed statement of the assets and liabilities of the Bonneville Power Administration as of June 30, 1958, and 1959.

The June 30, 1959 balance sheet shows accumulative net revenues of \$24,055,474. This surplus is based upon the depreciation cost accounting records and is not to be confused with the payout surplus of \$43,111,077 mentioned above and shown in footnote,¹ table III.

The difference of slightly more than \$19 million reflects primarily the difference between provisions for depreciation expense computed on the basis of the straight line depreciation method and scheduled amortization requirements computed on the conventional compound interest method. In the long run the two items will be approximately the same in total, but in the early years of the repayment period

Energy Sales

CLASS OF CUSTOMER



of the transmission investment the accumulative amounts of amortization lag behind straight-line basis provisions for depreciation expense.

Comparative Sales Data

Table V presents a statement of the sales of electric energy, both firm and nonfirm, by class of customer for fiscal years 1958 and 1959. In both 1958 and 1959, firm sales continued to rise but non-firm sales decreased, particularly in 1958 compared with 1957.

Specifically, firm sales increased \$2,744,000 and \$3,796,000 in 1959 and 1958, respectively. However, nonfirm sales decreased \$1,098,000 in 1959 and they fell substantially more than that in 1958 relative to 1957. In both 1956 and 1957 nonfirm sales approached \$12 million. Hence, the nonfirm sales of \$6,803,000 in 1959 represent a marked drop from the 1956-7 level.

Sales to the aluminum industry on a firm contractual basis increased slightly in 1959 but this increase was much more than offset by the drop in nonfirm sales for this industry. Sales to other industrial customers on both a firm and nonfirm basis increased by small amounts.

Firm sales to publicly owned utilities increased favorably but nonfirm sales to this group were down. However, the latter decrease resulted from the fact that 1958 nonfirm sales to public agencies were unusually high because of difficulties encountered by one large distributor at its own generating plants, thereby requiring the purchase of substantial amounts from the Federal system.

Sales to privately owned utilities decreased on both a firm and nonfirm basis.

The specific amounts of sales to the various customer groups and the increases and decreases are shown in table V.

Operations

Over 30 billion kilowatt-hours of electric energy were generated at the 13 Federal plants for the Bonneville Power Administration during the fiscal year 1959. This was an increase of 0.2 percent over the 1958 fiscal year. The addition of one generating unit at Chief Joseph and four units at The Dalles and the Roza unit added 387,250 kilowatts to the system giving a total of 5,721,250 kilowatts nameplate rating as of June 30, 1959.

The maximum coincident demand on the 13 Federal plants was 4,737,000 kilowatts, occurring October 7, 5-6 p.m., a 5.7 percent decrease from the all-time maximum demand of 5,024,000 kilowatts occurring during the 1958 fiscal year. Energy produced at Federal plants is shown by years in table VI and illustrated in the accompanying chart. Prepared on a quarterly basis, the chart shows the general trends of the Bonneville Power Administration's system-load growth.

Receipts and Deliveries

Bonneville Power Administration's transmission grid forms the backbone of the interconnected transmission system of public and private utilities in the Pacific Northwest. As a result, electric energy receipts and deliveries on Bonneville's transmission system cover many complex transactions in addition to receipts from Federal powerplants and deliveries by sales.

The integrated transmission grid assists in making possible the fullest utilization of power facilities in the area through use of diversities in peaking and water capabilities and diversity of system load conditions. Substantial quantities of energy are received and delivered as transfers from other utilities.

TABLE VI.—*Generation at Federal plants for the Bonneville Power Administration, fiscal years 1939–59*

BY FISCAL YEARS

Fiscal years ending June 30	Generation (thousands of kilowatt- hours)	Maximum demand (kilowatts)	Load factor (per- cent)
1939–41.....	1, 144, 932	210, 000	-----
1942.....	2, 549, 153	468, 000	62. 2
1943.....	5, 618, 436	841, 000	76. 3
1944.....	9, 239, 823	1, 355, 000	77. 6
1945.....	9, 051, 573	1, 427, 000	72. 4
1946.....	6, 236, 163	1, 346, 000	52. 9
1947.....	8, 753, 737	1, 335, 000	74. 9
1948.....	10, 885, 907	1, 610, 000	77. 0
1949.....	12, 925, 788	1, 797, 000	82. 1
1950.....	14, 140, 834	2, 106, 000	76. 7
1951.....	16, 472, 384	2, 535, 000	74. 2
1952.....	18, 555, 401	2, 784, 000	75. 9
1953.....	17, 633, 232	2, 867, 000	70. 2
1954.....	20, 195, 833	3, 301, 000	69. 8
1955.....	23, 253, 186	3, 651, 000	72. 7
1956.....	27, 599, 380	4, 479, 000	70. 1
1957.....	29, 984, 219	4, 887, 000	70. 0
1958.....	30, 201, 078	5, 024, 000	68. 6
1959.....	30, 263, 824	4, 737, 000	72. 9
Total.....	294, 704, 883	5, 024, 000	-----

BY PLANTS

	Generation ¹ (millions of kilowatt-hours)		Date in serv- ice ²	Operating agency
	Fiscal year 1959	Total to July 1, 1959		
Albeni Falls.....	231	958	Mar. 25, 1955	Army Engineers.
Big Cliff.....	89	491	June 12, 1954	Do.
Bonneville.....	3, 510	67, 459	June 6, 1938	Do.
Chandler.....	66	246	Feb. 13, 1956	USBR.
Chief Joseph ³	5, 359	17, 466	Aug. 20, 1955	Army Engineers.
Detroit ⁴	345	2, 344	July 1, 1953	Do.
Dexter.....	67	312	May 19, 1955	Do.
Grand Coulee ³	10, 296	166, 122	Sept. 28, 1941	USBR.
Hungry Horse.....	1, 012	5, 661	Oct. 29, 1952	Do.
Lookout Point ⁴	264	1, 588	Dec. 16, 1954	Army Engineers.
McNary.....	5, 588	27, 381	Nov. 6, 1953	Do.
Roza ³	66	66	Aug. 31, 1958	USBR.
The Dalles.....	3, 371	4, 611	May 13, 1957	Army Engineers.
Total.....	30, 264	294, 705		

¹ Includes energy generated in testing new generating units.

² Date of commercial operations.

³ Includes energy transferred for Bureau of Reclamation.

⁴ Excludes energy for condenser power at Detroit and Lookout Point.

During fiscal year 1959, 9 percent of the energy flowing over BPA lines was received from other utilities to be delivered either to other systems of the utilities furnishing the energy or to customers of the supplying utility. This percentage has increased rapidly in the last 4 years both in amount of energy and in percentage of total energy on the system.



The Grand Coulee Dam supplies more hydroelectric power for the Pacific Northwest than any other project in the U.S. Columbia River power system.

Fiscal years	Total receipts ¹ (billion kw.-hrs.)	Transfer in (billion kw.-hrs.) ²	Percent of total
1955.....	25.7	0.5	2.0
1956.....	31.1	5.8	2.7
1957.....	34.3	1.4	4.2
1958.....	34.0	2.5	7.4
1959.....	34.3	3.1	9.0

¹ From Federal generation, from other utilities for transfer, and uncontrolled.

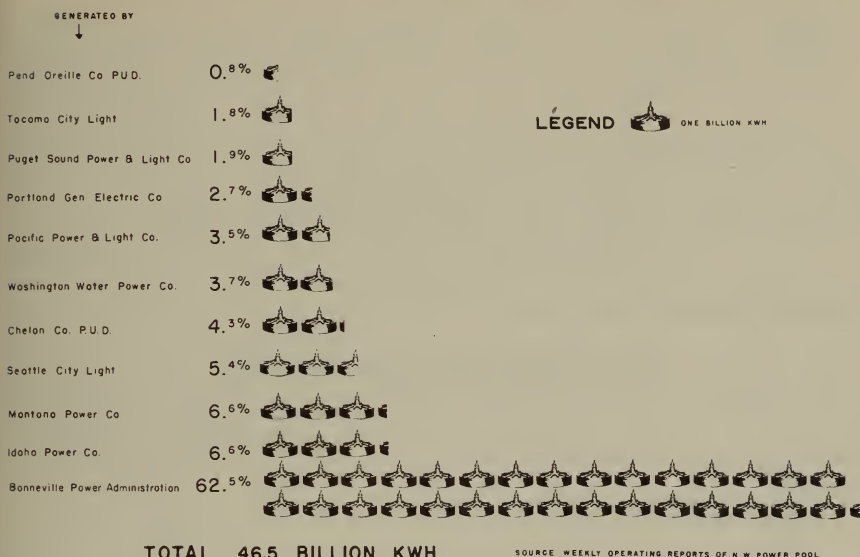
² From other utilities for transfer.

In addition to wheeling power from existing non-Federal plants such as Box Canyon, Rock Island, Pelton, and Swift, the BPA has entered into firm contracts for the wheeling of power from Priest Rapids, Rocky Reach, and Wanapum plants now under construction.

Transactions summarized in the electric energy account also involve storage by BPA in non-Federal reservoirs as well as storage by non-Federal utilities in the Federal reservoirs. Disposition of energy includes deliveries from storage in Federal reservoirs or to storage in reservoirs of other utilities, energy transfers for irrigation purposes for the Department of the Interior's Bureau of Reclamation from Grand Coulee, Chief Joseph, and Roza, energy used by the Bonneville Power Administration, and energy losses in transmission and transformation.

Power Generated BY THE PRINCIPAL ELECTRIC UTILITIES OF THE PACIFIC NORTHWEST

YEAR ENDED JUNE 30, 1959



THE ABOVE UTILITIES ARE MEMBERS OF THE NORTHWEST POWER POOL EXCEPT FOR CHELAN CO. AND PEND OREILLE PUBLIC UTILITY DISTRICTS. UTAH POWER & LIGHT CO. AND BRITISH COLUMBIA ELECTRIC CO. ARE ALSO POOL MEMBERS BUT ARE NOT INCLUDED IN THIS CHART BECAUSE THEIR MAJOR SERVICE AREAS LIE OUTSIDE THE PACIFIC NORTHWEST REGION.

Table VII, Electric Energy Account, summarizes energy receipts and deliveries for fiscal year 1959.

Sale of 29 Billion KWH

Energy sales to customers of the Bonneville Power Administration totaled 28.7 billion kilowatt-hours during the fiscal year 1959, an increase of 1.2 percent over 1958.

Firm energy sales to other utilities increased 4.4 percent in fiscal year 1959 over 1958 and nonfirm sales decreased 16.4 percent. The total net increase was 2.2 percent.

Firm energy sales to industries and Federal agencies were greater in 1959 than in 1958 by almost 3 percent, but the nonfirm sales to this group of customers decreased by more than 15 percent. There was no appreciable change in total deliveries.

TABLE VII.—*Electric energy account for fiscal year 1958*

Energy received (millions of kilowatt-hours) :

Energy generated at Federal plants for BPA ¹	30,264
Power interchanged in	4,050
Total received	34,314

TABLE VII.—*Electric energy account for fiscal year 1958*—Continued

Energy delivered (millions of kilowatt-hours) :

Sales	28,697
Power interchanged out	3,985
Used by Administration	31
Total Delivered	32,713
Energy losses in transmission and transformation	1,601
Losses as percent of total energy received—percent	4.7
Maximum demand on generating plants (kilowatts), Oct. 7, 1958	
5-6 p.m., Pacific Standard Time	4,737,000
Load Factor, total generated for BPA, percent	72.9

¹ For detail by plants, see table VI.*BPA energy sales—fiscal year 1959*

	Millions of kilowatt-hours	Percent change from 1958
Other utilities:		
Publicly owned utilities.....	9,356	+5.1
Privately owned utilities:		
Firm.....	5,553	-0.4
Nonfirm.....	1,035	-7.9
Total.....	6,588	-1.6
Ultimate consumers:		
Firm.....	11,035	+2.7
Nonfirm.....	1,718	-14.9
Total.....	12,753	0.0
Total BPA sales:		
Firm.....	25,644	+3.6
Nonfirm.....	3,053	-15.6
Total.....	28,697	+1.2

Delivery of interruptible energy to industries reached its lowest level during June-July-August of 1958. By June 1959 deliveries had recovered from a level of 10 percent to almost 50 percent of maximum deliveries made during the 1957 fiscal year.

The completion of new non-Federal hydro resources in the region has accounted for some reduction in deliveries of both firm and nonfirm energy to the privately owned utilities. In addition, sales to the five privately owned utilities starting September 1958 have been on a normal firm power basis of billing since the Bonneville Power Administration could guarantee to supply the utilities' firm power requirements for a period of 4 years. This resulted in a decrease in nonfirm deliveries and an increase in firm power deliveries when compared with sales under the restricted demand basis of billing in effect prior to September 1958. Favorable water conditions in the area throughout the year also reduced the nonfirm energy deliveries. The net effect of these factors was a decrease of less than 0.5 percent in firm sales and a decrease of 8 percent in nonfirm sales to privately owned utilities.

Composite Average Rate of 2.36 Mills

The Bonneville Power Administration has sold 275.7 billion kilowatt-hours of electric energy at a composite rate of 2.36 mills per kilowatt-hour during the 21 years of operation ended June 30, 1959. Sales to publicly owned utilities for the 21 years were 68.2 billion kilowatt-hours at an average of 2.77 mills. Privately owned utilities received 62.9 billion kilowatt-hours at an average of 2.26 mills, and ultimate consumers such as industries and Federal establishments received 144.6 billion kilowatt hours at 2.20 mills.

Power sales to aluminum plants were 112.2 billion kilowatt-hours at an average of 2.10 mills. These plants characteristically take power at very high load factors, approaching 100 percent, which results in the exceptionally low average cost on BPA's C and A rate schedules. Sales to industries other than aluminum, including sales to Federal agencies, were 32.4 billion kilowatt-hours at an average of 2.55 mills.

Energy sales by classes of customers are shown in table VIII.

TABLE VIII.—*Electric energy sales by class of customer, fiscal years 1939-59*

[Millions of kilowatt hours]

Fiscal years ending June 30	Industry		Publicly owned utilities	Privately owned utilities	Total
	Aluminum	Other industries ¹			
1939-41.....	523	5	35	537	1,100
1942.....	1,845	79	143	358	2,425
1943.....	3,589	507	435	739	5,270
1944.....	5,454	1,022	728	1,467	8,671
1945.....	4,667	965	824	2,057	8,513
1946.....	2,492	800	636	1,903	5,831
1947.....	4,212	627	1,045	2,378	8,262
1948.....	4,002	647	1,561	3,181	10,291
1949.....	5,666	881	2,081	3,342	11,970
1950.....	5,863	1,024	2,840	3,312	13,039
1951.....	6,545	1,538	3,414	3,579	15,076
1952.....	6,472	1,943	4,803	3,794	17,012
1953.....	6,547	1,947	5,110	2,791	16,395
1954.....	² 7,862	2,253	5,127	3,531	² 18,773
1955.....	² 8,352	2,624	6,274	4,580	² 21,830
1956.....	10,141	3,422	6,909	5,505	25,977
1957.....	² 10,096	² 3,581	7,970	6,565	² 28,212
1958.....	² 8,717	² 4,053	8,898	6,696	² 28,364
1959.....	8,295	4,458	9,356	6,588	28,697
Total to July 1, 1959.....	² 112,240	² 32,376	68,189	62,903	² 275,708

¹ Includes Federal agencies.

² Includes provisional and replaceable energy sales to industries:

	Aluminum	Other industries
Fiscal year:		
1954.....	28,355 mwh.....	-----
1955.....	22,956 mwh.....	-----
1957.....	323,509 mwh.....	27,817 mwh.
1958.....	481,522 mwh.....	32,194 mwh.

Rate Schedules

During the last fiscal year over seven-tenths of the energy sales were made under the C-4 wholesale rate schedule at an average rate of 2.12 mills per kilowatt-hour. This is the kilowatt-year rate for firm power delivered anywhere from the transmission system, and is also used with special measured demand provisions for sales of interruptible power.

Sales are generally made under this rate to industries operating at high load factor and to utilities having substantial generating facilities. Other sales were made principally under the E-4 rate schedule to utilities purchasing all or substantially all of their power requirements from the BPA. At-site power is sold on a kilowatt-year basis under the A-4 rate. Sales under the F-4 schedule were made to the utilities and industries requiring power at low load factor use, and under the H-schedule for dump, exchange, or experimental purposes. A summary of energy sales for the fiscal year 1959 classified by rate schedules is shown in table IX.

Special study by the staff was continued during fiscal year 1959 on BPA's entire wholesale rate structure and payout. As a result of the study, wholesale rates continuing the present \$17.50 per kilowatt-year level were filed with the Federal Power Commission to become effective commencing December 20, 1959. The Administration has maintained this same rate level since its organization in 1938.

TABLE IX.—*Electric energy sales by rate schedules during fiscal year 1959*

Rate schedule	Energy (thousands of kilowatt- hours)	Revenue ¹	Mills per kilowatt- hour
C-4:			
Industries	10,733,587	\$23,075,631	2.15
Utilities	9,743,433	21,467,085	2.20
Subtotal	20,477,020	44,542,716	2.18
F-4:			
Industries	6,113	26,033	4.26
Utilities	55,246	256,854	4.65
Subtotal	61,359	282,887	4.61
A-4:			
Industries	1,761,448	3,018,447	1.71
Utilities	12,269	40,888	3.33
Subtotal	1,773,717	3,059,335	1.72
E-4: Utilities ²	4,949,690	15,393,803	3.11
Experimental, H-3 and exchange: Industries and utilities	1,434,717	3,586,791	2.50
Total	28,696,503	66,865,532	2.33

¹ These revenues from sale of electric energy differ from official accounting records in that billing adjustments applicable to only fiscal year 1959 are included.

² Including Federal agency pumping loads.

Customers Served

The Bonneville Power Administration served 114 customers during fiscal year 1959. There were 75 publicly owned distributors of

power, 19 industrial customers, 11 Federal agencies, and 9 privately owned utilities.

Generation Added

Additions to the United States Columbia River power system in fiscal year 1959 have a nameplate rating of 387,250 kilowatts. One unit of 64,000 kilowatts was added at Chief Joseph completing the installation of units at this project. Four units with a total rating of 312,000 kilowatts were installed at The Dalles project leaving six units to be installed for the completed project. The U.S. Army Corps of Engineers is the construction agency for both of these projects. In addition, the Roza project of the Department's Bureau of Reclamation containing one generating unit with nameplate rating of 11,250 kilowatts was completed in August 1958.

Projects Summarized

Projects existing, under construction, and authorized for construction by the U.S. Army Corps of Engineers and Department's Bureau of Reclamation are shown in table X. The existing projects, including units installed to date in projects under construction, will provide 4,344,000 kilowatts of prime power when operated as a system. With completion of the projects under construction the prime capability will be 5,395,000 kilowatts and with completion of the authorized projects prime capability will be over 6,000,000 kilowatts.

Four 230,000 volt transmission lines carry power from McNary Dam powerhouse generators to the McNary switchyard from where it is transmitted to Pacific Northwest load centers.



TABLE X.—*U.S. Columbia River power system, general specifications, projects existing, under construction and authorized installations and capabilities correspond to a coordinated system operation, June 30, 1959*

Project	Location	Stream	Plant installations		Nominal prime power kilowatts ²	Pool elevation (feet)	Usable storage (acre-feet) ³	Average head (feet)	Date in service		Principal purposes ⁴
			Number of units	Total capacity kilowatts ¹					Initial unit	Last unit	
Existing:											
Bonneville.....	Washington-Oregon.	Columbia.....	10	518,400	466,000	74	Pondage	58	June 1938.....	December 1943..	P, N.
Grand Coulee..	Washington.....	do.....	18	1,944,000	1,552,000	1,288	5,072,000	315	September 1941..	September 1951..	P, I, FC, N,
Hungry Horse.	Montana.....	South Fork Flathead.	4	285,000	186,000	3,560	2,982,000	376	October 1952....	July 1953.....	P, I, FC, N,
Detroit.....	Oregon.....	North Santiam..	2	100,000	39,000	1,563.5	323,000	285	July 1953.....	October 1953....	P, I, FC, N,
McNary.....	Washington-Oregon.	Columbia.....	14	980,000	527,000	340	Pondage	75	November 1953..	February 1957...-	P, I, N.
Big Cliff.....	Oregon.....	North Santiam..	1	18,000	11,000	1,206	Pondage	91	June 1954.....	June 1954.....	P, Rereg.
Lookout Point.	do.....	Middle Fork Willamette.	3	120,000	34,000	926	336,500	185	December 1954..	April 1955.....	P, I, FC, N,
Albeni Falls...	Idaho.....	Pend Oreille....	3	42,600	21,000	2,062.5	1,155,000	18	March 1955.....	August 1955....	P, FC, N,
Dexter.....	Oregon.....	Middle Fork Willamette.	1	15,000	11,000	695	Pondage	53	May 1955.....	May 1955.....	P, Rereg.
Chief Joseph...	Washington.....	Columbia.....	16	1,024,000	856,000	946	Pondage	177	August 1955....	September 1958..	P, I.
Chandler.....	do.....	Yakima.....	2	12,000	11,000	618.5	Pondage	118	February 1956...-	February 1956...-	P, I.
The Dalles.....	Washington-Oregon.	Columbia.....	10	651,000	624,000	160	Pondage	84	May 1957.....	April 1959.....	P, N.
Roza.....	Washington.....	Yakima.....	1	11,250	6,000	1,220.6	-----	140	August 1958....	August 1958....	P, I.
				5,721,250	4,344,000	-----	9,868,500				

Under construction: The Dalles (Additions). Hills Creek.	Washington- Oregon.	Columbia.....	6	468,000	50,000	160	Pondage	84	August 1959.....	November 1960..	P, N.
	Washington- Oregon.	Middle Fork Willamette.	2	30,000	16,000	1,543	249,000	210	November 1961..	November 1961..	P, I, FC, N, PS.
	Washington- Oregon.	Snake.....	3	270,000	171,000	440	Pondage	95	December 1961..	December 1961..	P, I, N.
	Washington- Oregon.	South Fork McKenzie.	2	25,000	17,000	1,690	154,000	350	November 1962..	November 1962..	P, I, FC, N, PS.
Authorized: Libby.	Washington- Oregon.	Columbia.....	12	1,304,400	797,000	265	Pondage	104	June 1967.....	February 1969..	P, I, FC, N.
	Montana	Kootenai.....	4	344,000	257,000	2,459	5,010,000	265	-----	-----	P, FC, N, PS.
	Washington.	Snake.....	3	270,000	169,000	533	Pondage	92	-----	-----	P, I, N.
	do.	do.	3	270,000	180,000	633	Pondage	99	-----	-----	P, N.
Green Peter.	do.	do.	3	300,000	184,000	735	Pondage	100	-----	-----	P, N.
	Oregon.	Middle Santiam.	2	81,000	22,000	984	333,000	250	-----	-----	P, I, FC, N, PS.
	do.	do.	1	15,000	9,000	670	Pondage	90	-----	-----	P, Rereg.
	do.	do.		1,280,000	821,000 \$ -31,000	-----	5,343,000				
Total, 23 projects.				9,098,650	6,185,000	-----	15,614,500				

¹ Nameplate rating.
² Average capability in a coordinated system during an 8-month storage release period (September 1936 through April 1937).
³ Storage usable for power production.
⁴ P—Power; I—Irrigation; FC—Flood Control; N—Navigation; PS—Power Storage; Rereg.—Reregulating Reservoir.

⁵ Pumping requirements of 31,000 kw. represents the average power necessary to supply that part of irrigation water at Grand Coulee during the storage release period for 600,000 acres of the Columbia Basin project.

BPA—Branch of System Operations and Power Resources June 30, 1959.



A steel tower carrying one of the Bonneville Power Administration's Columbia-Covington 230,000-volt transmission lines marks the barren summit of the Cascade range at Stampede Pass enroute from Grand Coulee to Puget Sound and northwest Washington load centers.

Existing storage capacity usable for power in Federal reservoirs is 9,868,500 acre-feet. An additional 403,000 acre-feet will be provided by Cougar and Hills Creek on which construction is under way, and 5,343,000 acre-feet would be provided by Libby and Green Peter projects which are authorized for construction.

All generation and storage capacity under Federal construction will be in service by February 1969 under the present schedule. Service dates for the other authorized projects are not scheduled as no funds have been appropriated for their construction.

Non-Federal Additions

Non-Federal generating capacity in the area served by the BPA was increased in fiscal year 1959 by a total of 376,600 kilowatts. Principal additions include Pacific Power & Light's completed Swift No. 1 project which contains three generating units with a total nameplate rating of 204,000 kilowatts and Cowlitz County Public Utility District's completed Swift No. 2 project containing two generating units with a total nameplate rating of 70,000 kilowatts.

Other additions include installation of an additional 45,000 kilowatt unit at Pacific Power & Light's Merwin project, two units of 19,200 kilowatts each installed at Portland General Electric's completed North Fork project and installation of an additional 19,200 kilowatt unit at Portland General Electric's Faraday plant. Future additions under construction or licensed for construction by non-Federal utilities in the area are shown in table XI. These additions total 3,355,550 kilowatts as compared to additions of 3,445,250 kilowatts scheduled last year. The reduction of 94,700 kilowatts results principally from completion of certain scheduled projects.

Northwest Power Pool

Generation by the principal electric utility systems of the Pacific Northwest during the fiscal year 1959 is shown in table XII. All utilities listed are members of the Northwest Power Pool with the exception of the Chelan County and Pend Oreille County Public Utility Districts. These two utilities are included because they provided substantial amounts of generation to the pool. The Utah Power & Light Co. and the British Columbia Electric Co. are members of the pool but are not included as their major service areas are outside the region.

A total of 62.5 percent of the energy generated by the major utilities of the region was produced by the United States Columbia River power system. In addition to its other load the Bonneville Power Administration's transmission system delivered 9.1 billion kilowatt-hours of energy to meet the net requirements of eight other pool utilities.

Transmission System Growth

The Bonneville Power Administration grid was increased during the fiscal year to 7,936 circuit miles of transmission lines and 193 substations, totaling 14,004,955 kilovolt-amperes transformer capacity.

During the year, the transmission line mileage was increased 255 circuit miles, and the transformer capacity by 1,304,707 kilovolt amperes. A total of 9 new substations, ranging in size from 6,000 to 250,000 kilovolt-amperes, were installed and the transformer capacity was increased in 18 others.

Construction Program

Major grid additions completed in Oregon included a 230,000-volt line between Santiam and Eugene and a 250,000 kilovolt-ampere sub-

station at Fairview (near Coquille) to supply the additional power needs of this rapidly growing area. In western Washington 115,000-volt lines were added between Olympia and Aberdeen, Shelton and Fairmount, and Raymond and Willapa. To meet the rapid growth of the Columbia reclamation area in Washington a 250,000 kilovolt-ampere substation was added at Potholes (near Moses Lake), a 115,000-volt line between Columbia (near Wenatchee) and Quincy, and a 115,000-volt line between Potholes and Sand Dunes (near Moses Lake). Added service to the Northwestern Montana area was established through completion of the 115,000-volt Columbia Falls-Trego line.

TABLE XI.—*Non-Federal utilities generator installation schedule, July 15, 1959*

Utility and plant	Stream-	Unit	Nameplate rating (thousands of kilowatts)	Date in service
Washington Water Power Co.: Noxon Rapids.	Clark Fork-----	1	84	August 1959.
		2	84	November 1959.
		3	84	January 1960.
		4	84	April 1960.
Puget Sound Power & Light Co.: Upper Baker-----	Baker River-----	1 and 2	85	August 1959.
Lower Baker (addition)-----	Baker River-----	3	55	September 1960.
Grant County PUD: Priest Rapids-----	Columbia River-----	1	¹ 78.85	November 1959.
		2	¹ 78.85	December 1959.
		3	78.85	February 1960.
		4	78.85	April 1960.
		5	78.85	June 1960.
		6	78.85	August 1960.
		7	78.85	October 1960.
		8	78.85	February 1961.
		9	78.85	April 1961.
		10	78.85	June 1961.
Wanapum-----	Columbia River-----	1 and 2	166.2	September 1963.
		3	83.1	November 1963.
		4	83.1	January 1964.
		5	83.1	March 1964.
		6	83.1	May 1964.
		7	83.1	July 1964.
		8	83.1	September 1964.
		9	83.1	November 1964.
		10	83.1	January 1965.
City of Seattle: Gorge (reconstruction).	Skagit River-----		(²)	December 1960.
Montana Power Co.: Thompson Falls (additions).	Clark Fork-----	7 and 8	35	April 1961.
Chelan County PUD: Rocky Reach---	Columbia River-----	1	101.65	August 1961.
		2	101.65	September 1961.
		3	101.65	September 1961.
		4	101.65	December 1961.
		5	101.65	February 1962.
		6	101.65	April 1962.
		7	101.65	June 1962.
City of Tacoma: Mayfield-----	Cowlitz River-----	1	40	September 1961.
		2	40	December 1961.
		3	40	March 1962.
		4	40	June 1962.
Mossyrock-----	Cowlitz River-----	1	75	April 1965.
		2	75	July 1965.
		3	75	October 1965.
		4	75	December 1965.
City of Eugene: Carmen-----	McKenzie River-----	1 and 2	47.5	September 1962.
Trail Bridge-----	McKenzie River-----	1	6	September 1962.

¹ Operation at reduced head through January 1960 will reduce capability to about 47,000 kilowatts per unit.

² Reconstruction of diversion dam will increase gross head by 100 feet and peaking capability by 57,000 kilowatts.

TABLE XII.—*Generation by the principal electric utility systems of the Pacific Northwest, fiscal year 1959*¹

Utilities	Kilowatt-hours (billion)	Percent of total generation
Publicly owned:		
U.S. Columbia River power system	30.3	62.5
Chelan County PUD	2.1	4.3
Seattle City Light	2.6	5.4
Tacoma City Light .....	.9	1.8
Pend Oreille County PUD .....	.4	.8
Total publicly owned	36.3	74.8
Privately owned:		
Montana Power Co.	3.2	6.6
Idaho Power Co.	3.2	6.6
Washington Water Power Co.	1.9	3.9
Pacific Power & Light Co.	1.7	3.5
Puget Sound Power & Light Co. ....	.9	1.9
Portland General Electric Co.	1.3	2.7
Total privately owned	12.2	25.2
Total generation	48.5	100.0

¹ Generation shown is for members of the Northwest Power Pool plus Chelan County and Pend Oreille County Public Utility Districts. Utah Power & Light Co. and British Columbia Electric Company who are members of the Power Pool are not included because their service areas lie outside the Pacific Northwest region.

Under construction at the close of this fiscal year is a 345,000-volt, 128-mile line from Chelan County Public Utility District's Rocky Reach hydroelectric project to Maple Valley (near Seattle) to bring the output of the project to western Washington; a 125-mile, 287,000-volt line between Tacoma and Columbia which will be connected to the Grand Coulee line No. 3 at Columbia; and a 40-mile, 115,000-volt line from Albany to Toledo, Oreg.

Major new starts scheduled for fiscal year 1960 include an 81-mile, 345,000-volt line (230,000 volt operation) between Big Eddy (The Dalles Dam) and McLoughlin (near Oregon City and owned by Portland General Electric Co.) to supply the load growth in the northern Willamette Valley; a 40-mile, 115,000-volt line between DeMoss and Fossil and a 130-mile, 115,000-volt line between Redmond and Burns to bring direct service to these central Oregon areas.



A construction worker erects a steel tower on one of BPA's high voltage transmission lines against a background of the Bonneville Dam spillway.

Southwestern Power Administration

Douglas G. Wright, *Administrator*



FOR THE FISCAL YEAR 1959, Southwestern Power Administration of the Department of the Interior received \$1,031,250 by direct appropriation for its operation and maintenance program. Authorization by the Congress made \$4,405,000 available out of receipts to cover all costs in connection with the purchase of power and energy and the rental of transmission facilities. There was no new construction appropriation in fiscal year 1959, but funds in the amount of \$1,309,681 remained available for completion of previously approved construction programs.

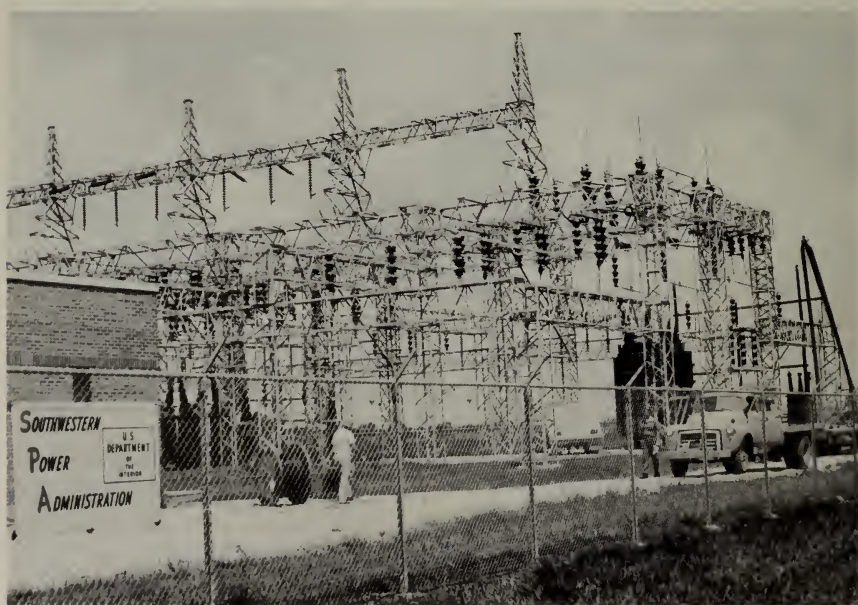
Power Resources

The installed generating capacity and capability in the hydroelectric and steam electric plants in the integrated system as of June 30, 1959, are shown in the following page.

With the completion of the installation and testing of the first two units at the Table Rock project in May, 1959, the installed capacity of the interconnected system was increased to 601,000 kilowatts. The power pool at Table Rock has not filled, but the project has been declared in limited commercial operation to utilize the water released for downstream requirements for power generation. By December 30, 1961, an additional 190,000 kilowatts of installed capacity will be available upon completion of the final 100,000 kilowatts at Table Rock and the addition of 90,000 kilowatts at Bull Shoals.

By the time the ultimate installation at Table Rock is available 40 miles of 154-kilovolt line from the project to Springfield will complete the interconnection with the grid.

Project or plant	State	River basin	Installed capacity	Dependable capacity	Capability June, 30, 1959
Hydroelectric:			<i>Kilo-watts</i>	<i>Kilo-watts</i>	<i>Kilo-watts</i>
Interconnected system:					
Bull Shoals.....	Arkansas.....	White.....	160,000	100,000	181,000
Denison.....	Oklahoma-Texas.....	Red.....	70,000	54,000	80,000
Fort Gibson.....	Oklahoma.....	Grand.....	45,000	45,000	48,000
Norfork.....	Arkansas.....	White.....	70,000	56,000	80,000
Table Rock.....	Missouri.....	do.....	100,000	69,000	80,000
Tenkiller Ferry.....	Oklahoma.....	Illinois.....	34,000	28,000	39,000
Subtotal.....			479,000	352,000	508,000
Isolated plants:					
Blakely Mountain.....	Arkansas.....	Ouachita (Red).....	75,000	75,000	75,000
Narrows.....	do.....	Little Missouri.....	17,000	14,000	17,000
Whitney.....	Texas.....	Brazos.....	30,000	24,000	29,000
Subtotal.....			122,000	113,000	121,000
Total hydroelectric.....			601,000	465,000	629,000
Steam:					
Central Electric Power Co-op.....			15,000	16,000	16,000
N.W. Electric Power Co-op, Inc.....			40,000	42,000	42,000
Western Farmers Electric Co-op.....			30,000	30,000	30,000
Total steam.....			85,000	88,000	88,000
Grand total.....			686,000	553,000	717,000



Clinton, Mo. substation is Southwestern Power Administration's northern hub for interchange of power requirements.

Energy Production

Reservoir inflow for the first 5 months of the fiscal year was exceptionally high. Since December 1, 1958, the flow has been below normal and low reservoir levels have reflected this condition. The reservoir system storage was approximately 90 percent full (not including Table Rock reservoir) at the end of the fiscal year. Table Rock, which has been filling since December 1, 1958, has filled its dead storage pool and approximately 10 percent of its power pool. Inflow data for the various projects are shown below:

Project and State	Stream	Percent of median flow		
		July 1, 1958 to Nov. 30, 1958	Dec. 1, 1958 to June 30, 1959	July 1, 1958 to June 30, 1959
Blakely Mountain, Arkansas.....	Ouachita.....	354	94	122
Bull Shoals, Arkansas.....	White.....	343	74	110
Denison, Oklahoma-Texas.....	Red.....	526	68	64
Fort Gibson, Oklahoma.....	Grand.....	345	58	132
Narrows, Arkansas.....	Little Missouri.....	278	93	110
Norfolk, Arkansas.....	North Fork.....	285	80	125
Table Rock, Missouri.....	White.....	370	72	113
Tenkiller Ferry, Oklahoma.....	Illinois.....	298	93	131
Whitney, Texas.....	Brazos.....	170	51	93
Weighted system average.....	.....	257	71	109

The net generation for the 1959 fiscal year for each project is shown in the following tabulation. The total net hydroelectric generation amounted to 1,323,107,420 kilowatt-hours of which 1,084,-495,200 kilowatt-hours were from the interconnected system.

Project:	<i>Net generation fiscal year 1959 (kilowatt-hours)</i>
Interconnected system:	
Bull Shoals	488,146,000
Denison	109,352,000
Fort Gibson	161,297,700
Norfolk	208,768,800
Table Rock	¹ 10,220,000
Tenkiller Ferry	106,710,700
Subtotal	1,084,495,200
Isolated plants:	
Blakely Mountain	175,753,000
Narrows	25,181,220
Whitney	37,678,000
Subtotal	238,612,220
Total hydroelectric	1,323,107,420

¹ Table Rock project considered in limited commercial operation, June 1, 1959, utilizing for power generation the water released for downstream interests.



Massive steel towers carry the 154-kilovolt transmission line out of the White River Basin north from the Table Rock Dam to Springfield, Mo.

Steam Plants

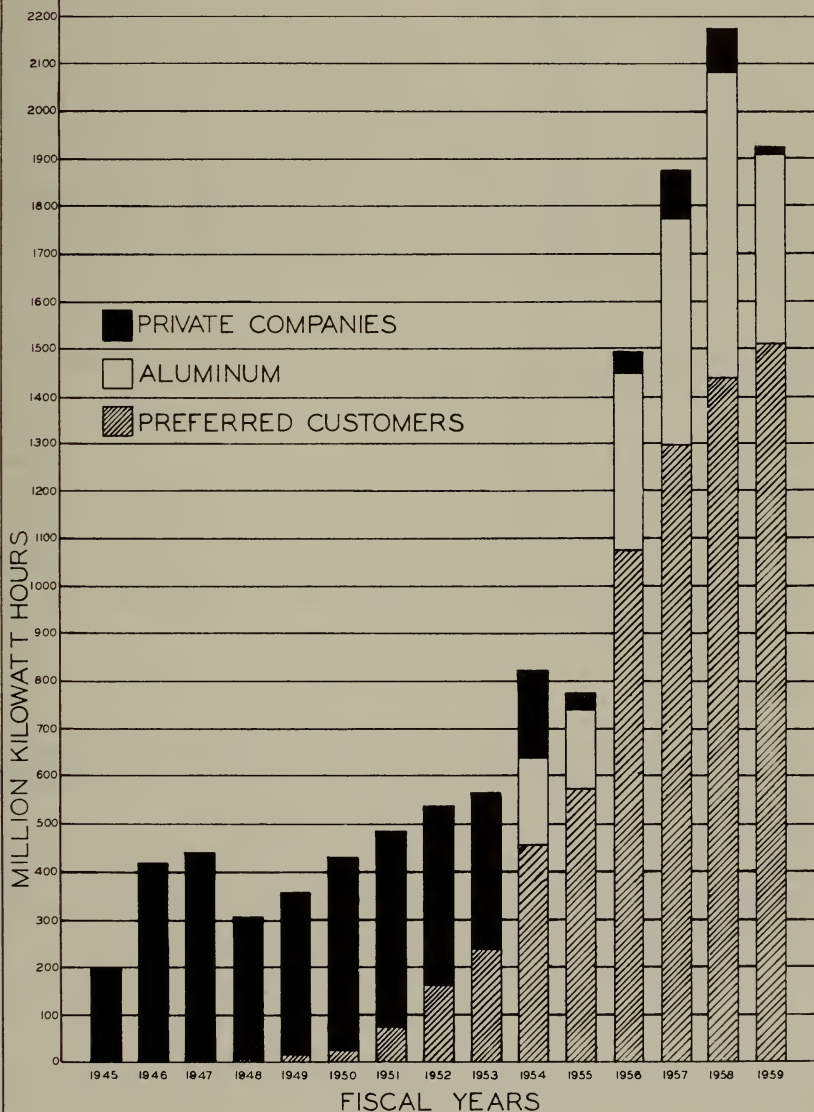
The amounts of energy generated by these plants for marketing during fiscal year 1959 are shown in the following table:

	<i>Net generation fiscal year 1959 (kilowatt-hours)</i>
Central Electric Power Co-op (Chamois, Mo.) -----	103,794,000
N.W. Electric Power Co-op (Missouri City, Mo.) -----	269,071,000
Western Farmers Electric Co-op (Anadarko, Okla.) -----	214,622,000
Total steam -----	587,487,000

Marketing

During the 1959 fiscal year, the electric power utilized by Southwestern Power Administration was obtained and disposed of as follows: 1,323.1 million kilowatt-hours generated at Federal multiple-purpose projects, 701.8 million kilowatt-hours obtained from ther-

ENERGY SALES BY MAJOR CUSTOMER GROUPS



mal-electric generation by others, for a total of 2,024.9 million kilowatt-hours. A total of 1,834.3 million kilowatt-hours (90.6 percent) was marketed as firm energy, while 89.5 million kilowatt-hours (4.4 percent) was marketed as secondary energy, with a total of 1,011.1 million kilowatt-hours (5.0 percent) as system losses.

It is noteworthy that deliveries to preferred customers amounted to 1,510.2 million kilowatt-hours, the equivalent of 114.5 percent of the hydroelectric energy available. Revenues from sales amounted to \$14,529,241.

The attached graph shows the yearly distribution of the sales among preferred customers, the Reynolds Metals Co. (aluminum refining), and the private utility companies. It portrays the growth and achievement of Southwestern Power Administration in supplying increased amounts of power to preferred customers.

During the 1959 fiscal year contract obligations were increased 22,740 kilowatts. Twenty-four new delivery points were added and nine were abandoned. Service to the Naval Air Technical Training Center at Norman, Okla., was terminated upon deactivation of the base.

At the end of the 1959 fiscal year the power commitments to preferred customers were as follows:

	<i>Kilowatts</i>
Distribution and G & T Cooperatives, 20 ¹ -----	259,965
Municipalities, 23 -----	53,780
Military Installations, 4 -----	10,610
Total -----	324,355

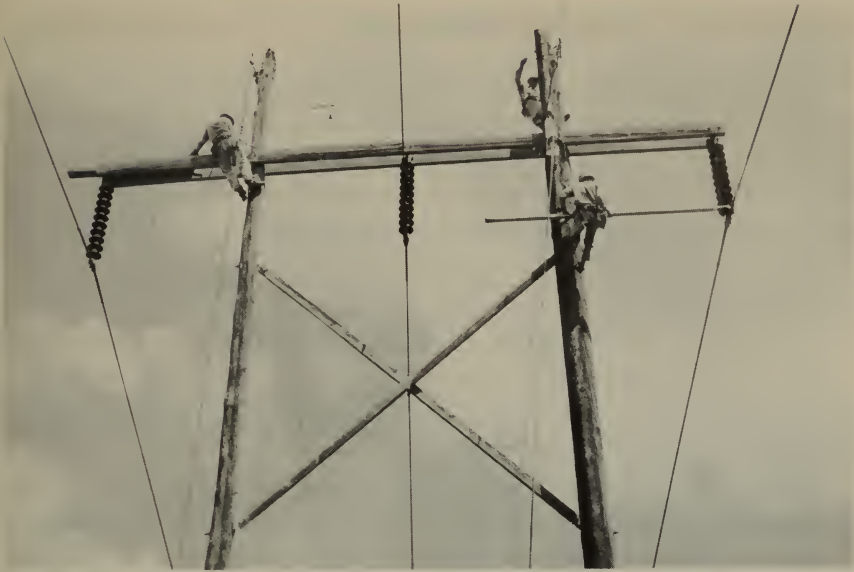
¹ Four distribution cooperatives formerly supplied by the Government through Texas Power & Light Co. joined the Tex-La Cooperative.

Contracting

A contract was consummated with one new preferred customer, the city of Blackwell, Okla., for 1,000-kilowatt capacity to supplement that supplied by the City's steam generating plant.

The integration of systems in the Southwest was advanced in fiscal year 1959 as the result of two interconnections between Western Farmers Electric Cooperative and the Oklahoma Gas & Electric Co. which serve to strengthen both systems. There is no sale of power between the parties. The accounting for the flow of power is accomplished through existing contracts of the Government with each party.

Eight electric distribution cooperatives in Texas, including the seven cooperatives formerly supplied by the Government through the Texas Power & Light Co. facilities, gained the advantages attendant



Maintenance crews of Southwestern Power Administration have a year round battle with the elements of nature such as shown here in the handling of a "live" 154-kilovolt line with a "hot-stick" in the replacement of a 65-foot pole on the 154-kilovolt grid.

to members of G & T cooperatives by forming the Tex-La Electric Cooperative. Power for Tex-La is supplied by the Government through the Texas Power & Light Co. facilities.

A new contract was consummated with the M & A Electric Power Cooperative. This new contract provides more complete integration for power from M & A's diesel generating plant with the Government's hydroelectric power.

A contract was consummated with the Kansas City Power & Light Co. whereby the company will purchase from the Government 75,000 kilowatts of peaking power, any part of which may be reclaimed by the Government for service of preferred customers, on 4 years' advance notice. It also provides an additional market for interruptible capacity and dump energy, and provides for limited conservation of water by allowing the Federal Government to take off-peak energy from the company during low water periods and return energy to the company during periods of adequate stream flow. It further provides that in the event the Government desires to serve a customer in the service area of the company, the Government will first negotiate with the company to supply such service for the

account of the Government, before other service arrangements are made.

Additional contracts are being negotiated for the sale of peaking power to private utility companies on a reclaimable basis. Studies are in progress to permit more complete integration of the Government's hydroelectric facilities with the companies to assist in serving preference customers, and with those customers of the Government having generating plants.

Southwest Field Committee

Southwestern Power Administration continued to participate in the general coordination activities of the Southwest Field Committee of the Department.

Accelerated upstream conservation programs, coupled with new construction on main stem projects, have emphasized the continuing value of close field level association among agencies of the Department of the Interior, and also have pointed up the value of exchange of program information at regular meetings and in preparation of the Regional Program Report.

Arkansas-White-Red Basins Interagency Committee

Southwestern Power Administration participated in all meetings of the Arkansas-White-Red Basins Interagency Committee during fiscal year 1959.

New construction on the Arkansas River and tributaries, with the problems incident thereto, stresses the continued responsibility of this coordinating agency to assure sound use of our natural resources.

The Federal Power Commission, as Chairman Agency for 1960, has been informed of the Department's interest in the development and conservation of all natural resources with special recognition being given to future high priority uses of water, reallocation of storage, and pump-back installations in connection with hydroelectric generating facilities.

At the January 1960 meeting of AWRBIAC, Southwestern Power Administration, with other power supply and distribution sources, is scheduled to present a comprehensive program on current power production and marketing procedures relating to the integrated systems of the area.

Litigation

The following litigation was closed during the fiscal year of 1959:

Civil Action 362-57, Allis-Chalmers Manufacturing Company v. United States, filed August 1, 1957.

Civil Action 129-58, Guthrie Electrical Construction Co. v. United States of America.

Civil Action 361, United States v. 150.53 acres of land in Benton County, Arkansas, D. L. Nichols, et al., and unknown owners.

Civil Action 4425, United States v. 1.3 acres of land, more or less (situated in Johnston County, Oklahoma), Guy Shelby et al., and unknown owners.

Civil Actions filed and continued are as follows:

Civil Action 1046, *United States v. 54 Tracts of Land in Greene County, Missouri, and John P. Kreider, et al.*, pending in the United States District Court for the Western District of Missouri, Southern Division, involves \$250 deposited therein for condemnation of a transmission line right-of-way across a tract of land (tract 36 (3003-32)) in which an individual owns a life estate and minor children own remainder interests.

Civil Action 5972, *United States v. Lands in Polk County, Texas, and N. C. Edens, et al.*, pending in the United States District Court for the Southern District of Texas, Houston Division, involves \$20 deposited therein for condemnation of a transmission line right of way across a tract of land (tract 18 (3306-18)) included in an estate which has not been probated.

Civil Action 1387, *United States v. 24.03 acres of land in McDonald County, Missouri, J. E. Wilson, et al., and unknown owners*, filed December 18, 1957, in the United States District Court for the Western District of Missouri, Southern Division, involved \$1,210 deposited therein for condemnation of transmission line rights of way across five tracts of land. Case pending as to one tract.

Southeastern Power Administration

Chas. W. Leavy, *Administrator*



DURING FISCAL YEAR 1959 Southeastern Power Administration of the Department of the Interior marketed 1,186,000 kilowatts of capacity (with peak generation of 1,411,720 kilowatts) and 2,713,306,086 kilowatt-hours of energy. It was sold to 52 public bodies, 74 rural electric cooperatives, 1 Federal agency, and 6 privately owned utilities.

Sales during the year earned \$14,863,863.87, as compared with \$19,006,631.67 for the previous year, bringing the revenue earned in all years to total \$90,681,192.68. The decline in revenues earned was due to generally poorer than average water conditions.

The output was generated at 10 U.S. Army Corps of Engineers projects. They were the Wolf Creek, Dale Hollow, Center Hill, and Old Hickory projects in Kentucky and Tennessee, the Allatoona and Buford projects in Georgia, the Clark Hill project in Georgia and South Carolina, the Jim Woodruff project in Florida, the John H. Kerr and Philpott projects in Virginia.

The installed generating capacity of 1,259,600 kilowatts includes a 12,000-kilowatt unit installed but not in operation at Cheatham project in Tennessee. Construction by the Corps of Engineers continued on Cheatham as well as three other projects (Walter F. George in Georgia and Alabama, Hartwell in Georgia and South Carolina, and Barkley in Kentucky). The construction underway will add 548,000 kilowatts of installed capacity.

Distribution of Sales

The combined output of Wolf Creek, Center Hill, and Dale Hollow projects continued to be sold to the Tennessee Valley Authority

under a long-term contract. The entire output of the Old Hickory project and the anticipated output of the first unit at Cheatham was sold under another long-term contract with the Authority. All of the Philpott project output was sold to Appalachian Power Co. under temporary arrangements pending the conclusion of negotiations for long-term sale.

Two-thirds of the Kerr project's output continued to be sold under long-term contracts to the Virginia Electric and Power Co., and to 17 cooperatives in Virginia and North Carolina and the remainder continued to be sold under long-term contracts to Carolina Power & Light Co. and to 16 public bodies and cooperatives in North Carolina.

Part of the Clark Hill project output was sold under long-term contracts to two public bodies in South Carolina. The one-half of the output of the Clark Hill project to be marketed in Georgia and the entire output of the Allatoona and Buford projects were sold under long-term contracts to Georgia Power Co. and 86 public bodies and cooperatives in Georgia. The output of the Jim Woodruff project was sold under long-term contracts to Florida Power Corp. and 6 public bodies and cooperatives in Florida.

The Congress appropriated for the fiscal year \$235,000 for headquarters operation and maintenance, and \$500,000 for the purchase of firming energy and the payment of wheeling fees. Southeastern's working force numbered 36 employees at the beginning of the fiscal year and 33 employees when the year ended.

Defense Electric Power Functions



THE ASSISTANT SECRETARY is responsible for carrying out the nonmilitary mobilization functions of the Secretary of the Interior with respect to electric power. Activities are concerned with the development and maintenance of plans to insure the continuity of adequate electric service under partial or full mobilization conditions.

Progress has been made with respect to a field organization to handle directly certain types of immediate post-attack problems, such as an emergency service for human survival and early restoration of essential power facilities. To assure that electric service will be available where most needed during such a period, reliance is placed on a field organization. Sixteen power areas have been established. These areas compare with the pool areas within which groups of interconnected utilities operate. Heading each area will be a director, with a deputy, an alternate, and a power utilization consultant. Of the 64 persons required to head the field organization, 50 percent have been appointed. As qualified persons are selected and security clearances obtained, further appointments will be made.

An Emergency Operations Handbook has been completed in draft form. It sets forth the plan of organization and operating guidelines for a Defense Electric Power Administration under conditions of a national emergency. These items are outlined to the extent that presently can be anticipated. The handbook contains information as to the Department of the Interior's responsibilities, organization charts with individual responsibilities and functions clearly outlined, suggested necessary preattack actions to get ready and stay ready, and procedures to be followed after an attack. The handbook has had preliminary distribution for comments and criticisms. After revision it will be distributed to electric utilities and affected governmental agencies.

A program has been effected to train electric power industry personnel as instructors in radiological monitoring. Radiological defense is an important function in providing for continuity of electric service in the event of a nuclear attack on the United States. Each electric power system must have a substantial and widespread corps, trained and equipped, to detect and measure radioactivity. This will be essential for the conservation of skilled manpower, so necessary for the operation of their remaining system and the restoration and continuity of service for human survival. Three 32-hour courses have been held for electric power personnel. These men, in turn, will instruct personnel in the industry to become radiological monitors and instrument operators for the detection of radioactivity. Additional courses at various locations will be given.

The Inter-Agency Committee on Essential Survival Items, established by the Office of Civil and Defense Mobilization, agreed on a list of power items considered necessary for national survival in a post-attack situation. The Office of Civil and Defense Mobilization has requested the Department of the Interior to supply information as to usage and inventory, by locations, of those items necessary for the restoration of facilities for transmission and distribution of electric power. A questionnaire was sent to some 900 power systems. Over 80 percent of the systems have replied. The information obtained will be inserted in the Office of Civil and Defense Mobilization's electronic computer at the National Damage Assessment Center. It will also be of value to the Department of the Interior in defense electric power mobilization planning.

Preparedness for damage assessment in the event of an enemy attack requires the assembling of comprehensive data on electric generating plants and substations. Data on some 500 generating stations and 1,700 substations have been furnished and used in the computer at the National Damage Assessment Center. A survey is being conducted jointly by the Department of the Interior and the Federal Power Commission of all electric power generating stations with a capability of 10,000 kilowatts or over and substations of 25,000 kilovolt-amperes or over. This survey will broaden the coverage on generating stations to some 1,200; obtain data as to plant vulnerability; and add both generating stations and substations that have gone into service since the last survey.

Office of Saline Water

Dr. Arthur L. Miller, *Director*



IT IS ESTIMATED that the oceans of the world contain 320-million cubic miles of water. The goal of the Office of Saline Water of the Department of the Interior is to develop low-cost conversion processes that will permit us to utilize this vast inexhaustable source of supply, as well as to develop processes that will economically convert unmeasured billions of gallons of now unusable inland brackish water to fresh.

Encouraging progress gives hope that this goal will be reached.

The cost of converting sea water to fresh is being reduced, while, at the same time, the cost of developing new supplies of natural fresh water is constantly increasing. In some localities these cost curves have already crossed.

A milestone in the history of saline water conversion in the United States was reached this year when Coalinga, Calif., became the first city in the country to obtain its drinking water supply from converted brackish well water. For years the citizens of Coalinga had to haul in their drinking water at a cost of \$7 per 1,000 gallons. The installation of a conversion plant has cut their water bill to \$1.45 per thousand gallons.

In the coming years the same will be true for more and more of our cities and communities—water from the sea or brackish water sources will be the most economical and dependable source of supply.

Progress in the field of lower cost conversion or desalting of saline waters has been such that the initial period of exploratory research in the laboratory must now in part be replaced by field testing of the more promising processes. In recognition of this need and in view of the potential benefits, President Eisenhower

approved, on September 2, 1958, a new \$10-million authorization to fill this requirement.

Public Law 85-883 authorizes the construction and operation of not less than five saline water conversion demonstration plants. Three of these plants will test sea-water conversion processes. One will be located on the east coast, one on the west coast and one on the gulf coast. At least two of these plants will have a designed capacity of not less than 1-million gallons of fresh water per day. Two plants will utilize processes for the conversion of inland brackish water to fresh. One will be located in the Northern Great Plains and one in the arid areas of the Southwest. One of these plants must have a designed capacity of at least 250,000 gallons per day.

As a part of the law, Congress established a timetable for the selection of processes to be tested in the demonstration plant program. This schedule required the Secretary of the Interior to select the first process on or before March 2, 1959, and the remaining four processes at three-month intervals thereafter.

To implement this new phase of the Saline Water Conversion Program, and at the same time increase the emphasis on research and development, the activities of the Office of Saline Water were divided into three interrelated divisions; Basic Research, Processes Development, and Demonstration Plants.

Basic Research

Low-cost saline water conversion is a problem which to date has not been satisfactorily solved. New ideas and new processes are needed and can be developed effectively through basic or fundamental research.

Fundamental research efforts conducted under contract with universities and research organizations by the Office have obtained good results and new knowledge has been developed.

Current fundamental research includes studies of scale deposition on heated surfaces, transport depletion, electrical control of adsorptivity, the use of algae, ion selective membranes, solvent extraction, ion retardation resins chelation, and possible utilization of energy in the concentrated waste brines of conversion plants.

The formation of scale deposits in distillation equipment, and in some instances, electrodialysis equipment, is a serious problem, and it is important that methods for eliminating scale be developed. Fundamental research aimed at attaining a better understanding of scale formation and developing means of alleviating or controlling it is being carried on.



Using the sun's heat to desalt sea water. This solar research station south of Daytona Beach yields 500 gallons per day of fresh water.

Studies are being conducted on the electrical control of adsorptivity, a process based on the principle that a charge can be induced on a conductor, in contact with an electrolytic solution, by changing its electrical potential through an outside source. The soundness of the principle has been demonstrated and a rudimentary demineralization cell has been constructed and operated.

The conversion of saline water through the use of algae was suggested and an exploratory investigation was initiated. This theorized method would grow algae in a basin of sea water under conditions favorable for the uptake of salt by the algae. The algae would then be mechanically separated from the water and removed to a second basin where conditions would be such that their metabolism would be inhibited, causing the algae to deposit the absorbed sodium chloride. Over 100 different species of marine algae have been studied and six species have been found to accumulate sodium ions.

Fundamental research on ion-selective membranes is continuing and includes work on the development of a sulfate-specific membrane, development of laboratory test procedures for characterizing membranes, and the critical evaluation of all available ion-selective membranes.

Exploratory research on the possibility that fresh water might be extracted from saline water by means of certain organic liquids is under way. The method has been shown to be technically feasible

and considerable potentially valuable scientific data has been obtained.

Several new proposals, some of which appear to have considerable merit, have been submitted for consideration during the year. It is interesting to note that a number of these have been received from major industrial firms.

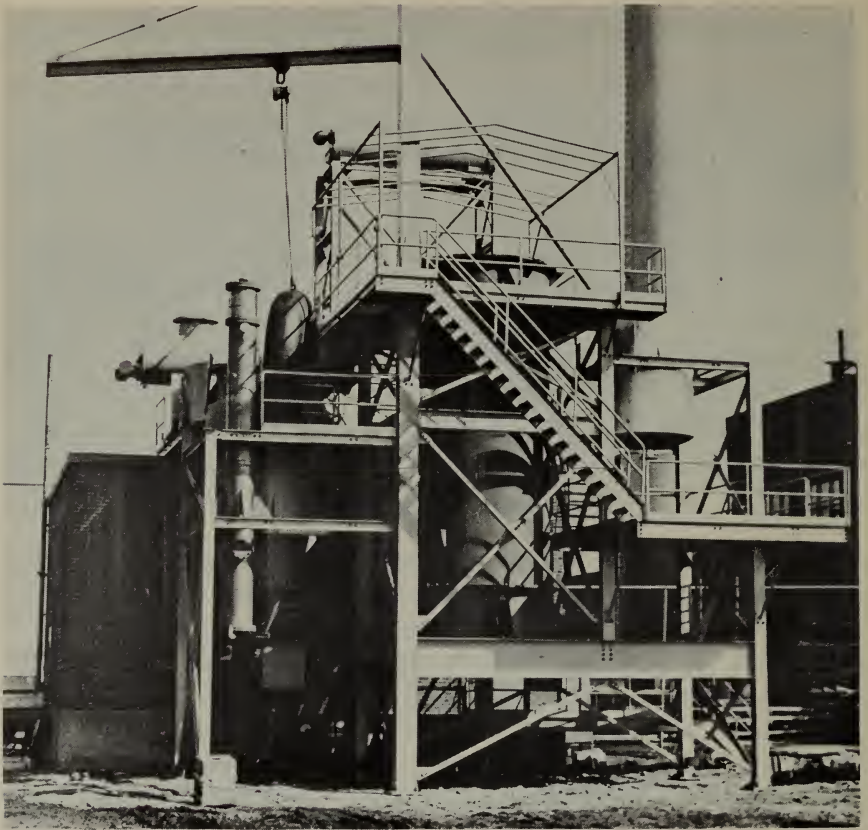
The investigation of these new ideas and the exploratory research leading to the development of new and improved processes is the responsibility of the Basic Research Division. As laboratory investigations and experiments progress, additional laboratory work may continue while pilot plant activities and field testing on a larger scale becomes the responsibility of the Processes Development Division.

Processes Development

Excellent results have been obtained from the operation of a pilot plant located at Harbor Island, N. C. Testing the long-tube vertical multiple-effect distillation process under conditions that would be encountered in a full multiple-effect cycle, formation of one type of scale on heating surfaces, a major technological problem in distillation processes, has been eliminated at higher temperatures than heretofore possible. The pilot plant has been in almost continuous operation since its startup in November 1957. Further process improvements are anticipated through extended and more severe operational tests now underway.

Following basic research and laboratory development, a contract was awarded for a 15,000 gallon per day pilot plant to test a promising new freezing process. This process utilizes flash evaporation of pre-cooled sea water to produce ice and countercurrent washing to separate the ice-brine mixture. Inherent advantages of a freezing process, such as lower energy requirements to reduce the temperature of sea water to freezing as compared to raising it to the boiling point, and a lesser tendency towards scaling and corrosion, indicate that such a method should be able to compete economically with the developments in the distillation field.

Since 1952, electrodialysis has developed from a laboratory phenomenon to the point where it is now one of the leading processes for demineralization of brackish water. An extensive testing and evaluation of experimental electrodialysis equipment is underway at the Department's Bureau of Reclamation Laboratories in Denver, Colo. An electrodialysis unit developed by the Netherlands TNO has been purchased for operational testing at the laboratory.



Sea water conversion pilot plant designed to convert 15,000 gallons of sea water a day to fresh. This experimental facility uses a direct-freezing process developed by the Carrier Corporation. After preliminary testing at the Syracuse, N.Y. headquarters of the company, it will be moved to a sea shore location for extensive tests on raw sea water.

A sea water conversion solar distillation research station has been established at Daytona Beach, Fla. Prototypes of various existing improved designs of stills are being installed and operated as a means of further development. It is anticipated that this program will produce engineering designs and specifications for practical small plants and will point the way for future solar distillation plants of larger capacity.

Twenty-two process development contracts are in force. Distillation processes under study, aside from the long-tube vertical, include flash evaporation, vapor-compression, rotary and tubular type with forced circulation. Phases of distillation applicable to many processes, such as scale formation, corrosion, heat transfer,

and pretreatment of water are also under study. Contracts on membrane processes include electrodialysis, osmionic, and reverse osmosis. Freezing process investigations include controlled crystallization, multi-stage washing, direct freezing by flash evaporation and direct freezing by use of a secondary refrigerant.

Demonstration Plants

Much of the activity of the Office of Saline Water during the past year has been directed to the inauguration of this program. National and worldwide interest brought an increased and continuing wave of inquiries, suggestions, proposals, and applications.

The initial phase of the demonstration plant activity was the selection of the processes to be tested in this new program. A special board, representing science, industry, and government was appointed to study the economic feasibility and potential of various saline water conversion processes recommended by the Processes Development Division.

Seventeen separate processes were evaluated by the Selection Board in order to judge which process would best meet the criteria developed by the Office of Saline Water and the Selection Board for these plants. After careful consideration the Board recommended the selection of the long-tube vertical multiple-effect distillation process for the first demonstration plant.

The development of the long-tube vertical processes started in 1954. The Office of Saline Water contracted with the consultant engineering firm of W. L. Badger & Associates of Ann Arbor, Mich., to conduct a detailed study of the potential economic advantages of multimillion gallon per day distillation cycles. This collaboration led to the establishment of the experimental facility at Harbor Island, N.C. Favorable test results obtained from this pilot plant were the basis of the Board's selection of this process.

The newer commercial conversion plants utilize the multi-stage flash distillation process. Improved design and performance specifications proposed by the Office of Saline Water, and private research and industrial organizations, led to the selection of this process for the second demonstration plant.

An electrodialysis process was selected to be tested in the third demonstration plant. Six years ago this process was little more than a laboratory phenomenon. Today it is a commercial reality, providing one of the most economical methods of demineralizing brackish water.

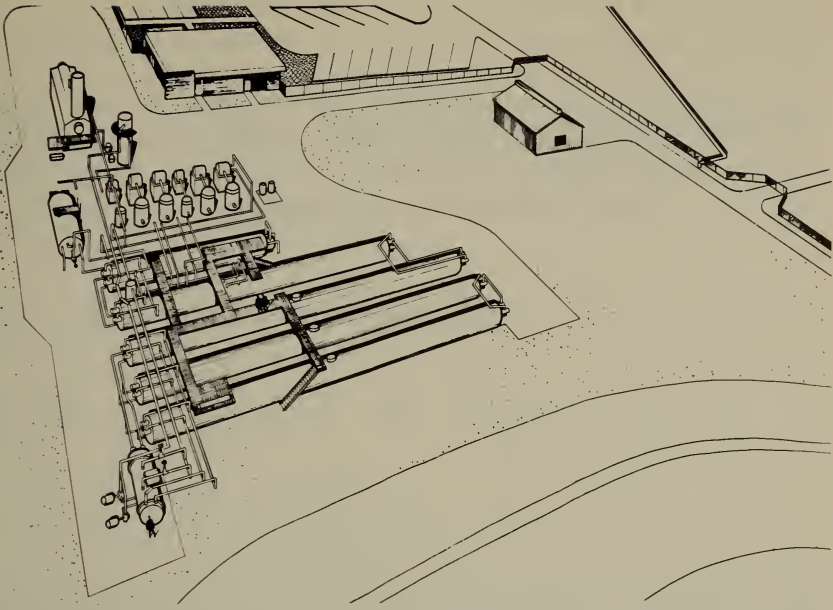
Electrodialysis utilizes a combination of electric current and thin ion-exchange membranes to remove the dissolved salts from water.



The developmental work on the long-tube vertical multiple effect distillation process, selected for demonstration plant testing in a 1-million gallon per day plant at Freeport, Tex., was carried on in this pilot plant located at Wrightsville Beach, N.C.

Site Selection

Over 175 cities and communities asked to be considered as a site for one of the five saline water conversion demonstration plants. A special Site Selection Board, composed of engineers from outside Government with long experience in water supply problems, was appointed to evaluate these proposals and make recommendations to the Secretary of the Interior.



Artist's conception of the 1 million gallon per day multistage flash distillation process sea water conversion plant to be constructed on the California coast.

The Site Selection Board compared and evaluated information submitted by interested cities, together with technical site data obtained by personal inspection of proposed sites by staff engineers, with the exception of California sites, which were inspected by engineers of the California Department of Water Resources.

Based on these evaluations, members of the Board selected the best qualified sites and then conducted a comprehensive personal inspection of these sites before making their recommendation to the Secretary.

Proposed sites were evaluated by a rating system which compared technical factors (62 percent), demonstration value (24 percent), and assistance offered (14 percent).

As the fiscal year drew to a close, a decision was reached on the location of the first plant. Acting on the recommendation of the Site Selection Board, Secretary Seaton selected Freeport, Tex., for the gulf coast plant which will demonstrate the long-tube vertical process. This plant will be designed to convert sea water to fresh at the anticipated rate of one million gallons per day.

Progress in conversion cost reduction has been made and will continue. Just prior to World War II, the cost of converting sea water

to fresh ranged upward from \$4 per thousand gallons. Since that time, even though rising cost indices have advanced all dollar costs, the cost of sea water conversion has been greatly reduced. In the most efficient existing sea water conversion plants the cost is now about \$1.75 per thousand gallons. It is anticipated that the first two sea water distillation demonstration plants will produce fresh water from the sea for about \$1 per thousand gallons.

Office of the Assistant Secretary

Mineral Resources

Royce A. Hardy, *Assistant Secretary*



THE ASSISTANT SECRETARY for Mineral Resources discharges the responsibilities of the Secretary of the Interior with respect to the Department's programs in the field of the development and utilization of minerals and metals, including mineral fuels. He exercises supervision over the Geological Survey, the Bureau of Mines, the Office of Minerals Exploration, the Office of Oil and Gas, the Office of Minerals Mobilization and the Office of Geography.

The Assistant Secretary serves as the principal spokesman for the Department of the Interior in the field of mineral affairs at the policy-making level within the Federal Government. He participates in meetings of the Council on Foreign Economic Policy as the Department's liaison representative, and is the Department's representative on the Committee on Government Activities Affecting Prices and Costs.

The Office coordinates the Department's representation on the Advisory Committee for Export Policy and its operating committee. These interdepartmental advisory committees are utilized by the Department of Commerce in carrying out its responsibilities under the Export Control Act of 1949. As a result of extensive reviews made of the lists of materials controlled for security and for short supply reasons, all materials except certain nickel-bearing items were removed from short supply controls.

In addition to the foregoing responsibilities, the Office of the Assistant Secretary, Mineral Resources, is the principal point of contact between the Federal Government and the mineral industries.

Members of the staff of the Office of the Assistant Secretary, Min-

eral Resources, participated in a series of three meetings sponsored by the United Nations to consider possible international action to meet the problem posed by world over-supply of lead and zinc. The third meeting, held in New York in early May, witnessed the development of a limited arrangement to reduce production, exports and sales of lead and zinc.

Legislation was submitted to the 2d Session of the 85th Congress to implement the long range helium conservation program which had received presidential approval in the preceding fiscal year. The proposed measure reached the Congress too late to be considered. At year's end, the legislation, with some revisions, was ready for resubmission to the Congress.

The Office of the Assistant Secretary, Mineral Resources, continued to supply information and advice to the Director of the Office of Civil and Defense Mobilization concerning administration of the Government's strategic stockpiling program. The Office maintained a review of the overall stockpile situation and was active in the development of modifications in stockpile and stockpile disposal policies. Additionally, the Office continued its active role in advising the Department of Agriculture with respect to acquisition of strategic and critical material for the supplemental stockpile through barter transactions.

The Office continued its extensive participation in interdepartmental discussions dealing with basic problems of petroleum supply and requirements from both national security and peacetime economic standpoints. The Assistant Secretary, Mineral Resources, served as Chairman of the Oil Import Appeals Board, which was established to hear appeals arising from the program of mandatory import controls on petroleum and products.

The Office was active in the establishment of the Office of Minerals Exploration, and participated in the formulation of the policies that are governing its operations. The new agency administers a program of federal financial assistance to exploration activities, similar to that administered by its predecessor, the Defense Minerals Exploration Agency.

Geological Survey

Thomas B. Nolan, *Director*



CONTINUING AND CONSTRUCTIVE PROGRESS in our national technological knowledge has been an objective of the Geological Survey ever since Congress established this bureau as an agency of the Department of the Interior 80 years ago. Its surveys, investigations, and reports have helped dispel recurrent fears that maximum yields of water, minerals, or energy would be insufficient to sustain this country's constantly increasing population. In retrospect, the work of the Department's Geological Survey has been characterized by major contributions to natural resource development and conservation activities.

Predicted deadlines for the exhaustion of many non-renewable mineral raw materials and fossil energy sources have come and gone. Basic research and related applied science and engineering have been successful in establishing and applying principles that make it possible to find hitherto unknown resources on the one hand, and to devise new techniques with which to transform formerly uneconomic materials into usable products on the other.

A need for more and more water will continue to command a significant role for the hydrologic aspect of the Survey's scientific program. A steadily rising population and future expanded levels of economic activity will demand more complete map coverage of the United States. Field and laboratory work to determine the geologic conditions throughout the country and the physical and chemical conditions associated with geologic processes will be needed in the search for new ore and fuel sources and in producing a sound base for the engineering construction and urban development required by our dynamic economy. Supervision of mineral lease operations on Federal and Indian lands and the classification of public lands as to mineral and water power potential similarly are expected to climb,

with attendant increasing royalties for the United States Treasury, the States and the Indians.

The following report summarizes technical and publications activities of the Geological Survey of the Department of the Interior during fiscal year 1959. It illustrates how Survey scientists, engineers and administrators have shared in promoting the highest standard of living the world has yet seen:

Geologic Division

The Geologic Division is investigating and appraising our geologic and mineral resources through a continuing long-range research program of geologic mapping, and topical field and laboratory studies. This program is designed to provide fundamental data adequate to meet the varied and ever-increasing needs of the Nation in the fields of minerals and mineral fuels, engineering construction, water and land utilization, and educational and cultural activities. Geologic concepts and methods of exploration for mineral resources are under continuing review; existing principles and techniques are being refined and new ones are being developed.

Complementing its own program of research, the Division in fiscal 1959 continued to provide technical data and evaluations to many other government agencies. About one-third of the Division's total funds were expended on such work. Many research studies in fissionable materials, both in the field and in the laboratory, were made for the Atomic Energy Commission. Data and services were provided to the Armed Forces, the Puerto Rico Economic Development Administration, the International Cooperation Administration, the Office of Minerals Exploration, the Office of Mineral Mobilization, the Office of Oil and Gas, the Bureau of Public Roads, the Office of Civil and Defense Mobilization and others.

Cooperative programs were in progress with a number of States. As in past years, Survey geologists served as consultants to the National Science Foundation and to various defense agencies.

Twenty-seven professional papers, 65 bulletins, 91 maps, and 2 circulars were published in the regular Survey series of publications. In addition 43 reports were placed on open file and approximately 250 reports were published in scientific journals.

Mineral Deposit Investigations

Field and laboratory research investigations that will contribute to increased knowledge of mineral resources are in progress in many fields.



A Department geologist examining thin sections of potash ore with a petrographic microscope.

Among the new projects of this type is a full-scale investigation of bauxite deposits on the island of Kauai, Hawaiian Islands.

Programs now in progress designed to build on the extensive data obtained during earlier Defense Mineral Exploration Administration activities, include a critical study of the Phillipsburg, Montana manganese deposits, determination of the regional relations of the North Carolina pegmatite districts, and the final phase of a long range study of the Coeur d'Alene mining district in Idaho.

Studies in the geochemistry of sea water, the concentration of important elements in the sea, and the deposition of these elements in sedimentary rocks were begun. Work continued on the development of techniques of geochemical prospecting. Investigations of light-isotope ratios, one of the more promising approaches to the problem of ore genesis and the location of new ore deposits, were also continued.

Investigations directed toward extension of known minerals districts include studies of the Ely, Nev., area which contains one of the large porphyry copper deposits of the Nation. Detailed studies of the Nation's largest known uranium reserves, at Ambrosia Lake, N. Mex., are directed toward determination of ore controls and may help to discover extensions of ore-bearing strata.

In the continuing search for new mineral resources, 13,000 thin and polished sections of rocks and minerals were prepared for examination by geologists, and nearly 14,000 samples were analyzed by chemical, spectrographic, X-ray, microscopic, and other methods.

Airborne radioactivity and magnetic data obtained while monitoring atomic reactor sites for the Atomic Energy Commission are providing new geophysical information on large areas of the United States, including parts of many mining districts. In fiscal 1959, 80,000 traverse miles were flown around 11 sites.

Field and laboratory investigations were made of the possible use of electrical prospecting methods in the iron and copper ore districts of the Lake Superior region and the sulfide ore districts of northern Maine. Experimental measurements made in the Gogebic Iron Range of Wisconsin indicate that variable frequency electromagnetic techniques can be used to estimate magnetic susceptibility and hence the magnetite content of taconites. Such knowledge of a particular taconite would aid in tracing geophysically a concealed body of this low-grade iron ore.

Geophysical and geochemical studies in the valley fill of the Basin and Range Province are directed toward the discovery of concealed ore districts. Many ore districts in the bedrocks of the ranges are known, but two-thirds of the province is covered by young alluvial sediments. One of the greatest challenges to geology is to discover the major ore deposits that surely must exist, concealed beneath these young sediments. A new comprehensive geologic, geophysical, and geochemical exploration program was started in the Twin Buttes, Ariz. porphyry-copper district where major new deposits have been found under alluvium.

Evaluation of areas of low-grade mineral materials that may eventually become sources of critically needed commodities include a study of the environment and geochemistry of the large reserves of iron and other elements in submarginal sedimentary deposits and in massive sulfide veins in the southeastern United States.

A study of the geology of rare-earth deposits, aimed toward evaluating their reserves, and understanding the geochemistry of these elements in different geologic environments, is in progress, as is a systematic evaluation of the Lake George beryllium deposits in Colorado, one of our principal domestic sources of this important element.

In the laboratory attention was directed to development of faster

and more accurate methods for analysis of rarer elements such as beryllium, rhenium, niobium, and fluorine. An electron probe analyzer was developed for analysis of minute grains in rocks and minerals by exciting characteristic X-rays by which the elements in the material are identified and estimated without destruction of the sample.

An intensive program of fundamental research on minerals led to several important advances in knowledge of conditions under which ore deposits were formed. Of immediate economic importance were field and laboratory studies of the borate minerals, and the discovery of a remarkable assemblage of rare minerals in the significant sodium carbonate deposits of the Green River formation of Wyoming and Colorado.

Mineral Fuels Investigations

Mapping and stratigraphic studies designed to provide information needed for exploration programs were in progress in 24 petroleum-producing or potentially producing States. In six of these States the work was conducted in cooperation with State agencies.

Investigations of coal-bearing areas were carried on in 10 States and appraisals of reserves were continued in 5. A project was started to reappraise the coal resources of Washington in cooperation with that State. A revised edition of the coal map of the United States was prepared for publication, and revision of the circular on coal resources of the United States was begun.

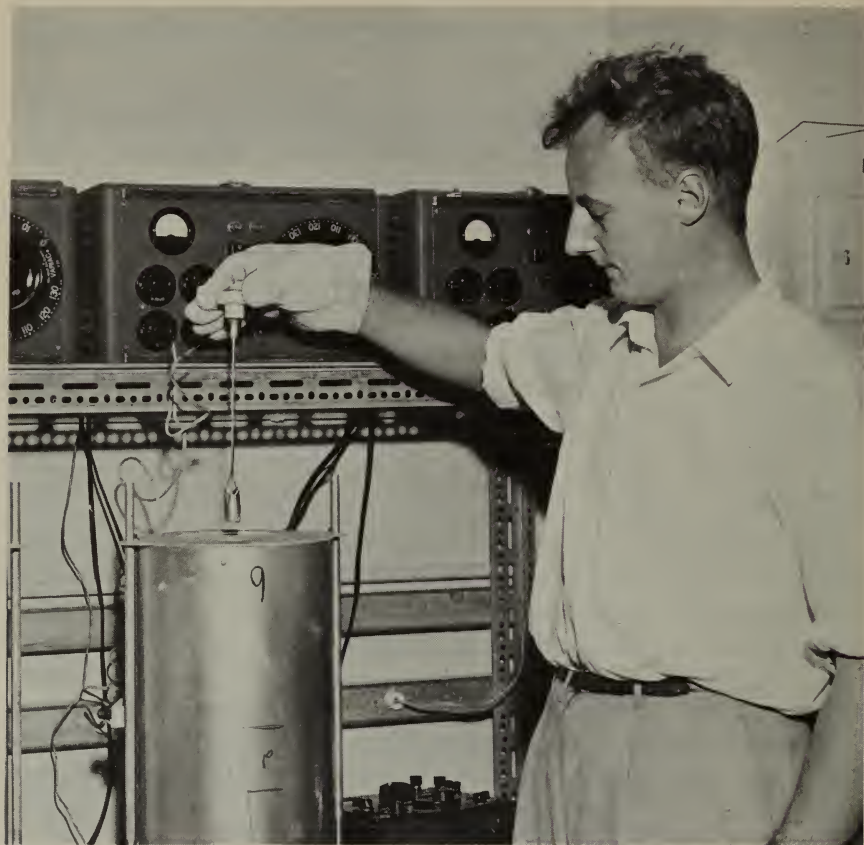
In conjunction with the Office of Oil and Gas and the Bureau of Mines, the Survey participated in a special study of the over-all potential of the United States petroleum industry in 1975. This extensive study is being undertaken by the Department of the Interior at the request of the Office of Civil and Defense Mobilization.

A folio of paleotectonic maps and charts showing the distribution, character, and variations in strata of the Triassic system of the United States is in press. A similar folio on the Permian system is nearing completion.

The first aeromagnetic map of an entire State, the map of Indiana, was published in a professional paper. A theoretical map of the basement surface derived from the magnetic data shows several structural features of possible significance in exploration for oil and gas.

General Service Geology

General service geology includes the gathering of geologic data needed in planning civil engineering works and programs of water



Geological Survey chemist removing a synthetic-sulfide mineral melt from a precision-controlled high temperature electric furnace.

and land utilization and fundamental research in various aspects of the earth sciences.

Thorough knowledge of earth materials is necessary for efficient land development. In metropolitan areas engineering geology investigations were conducted in Los Angeles, San Francisco, Seattle, Portland, Oreg., Denver, Knoxville, and Omaha. Cooperative geologic mapping programs with the States of Massachusetts, Rhode Island, Connecticut, and with the Puerto Rico Economic Development Administration are in progress.

Geologic factors that complicate urban growth, such as landslides, mudflows, and cliff erosion were subjects of basic research.

Emphasis was placed on extending knowledge of such processes as rock metamorphism, the structural development of mountains,

erosion and deposition by streams and glaciers, and the growth of soils, as part of the program of fundamental research.

Generalized geologic maps of large areas, such as States or regions, are major tools in private mineral exploration and in many public planning activities. New geologic maps, embodying the most up-to-date work from all sources, are in preparation for several States; in addition, a new summary tectonic map of the continental United States, prepared in collaboration with the American Association of Petroleum Geologists, is well underway.

Experimental work on solubilities and the formation of various minerals in water and steam at high temperatures and pressures was continued, and some of the results were applied to the study of underground nuclear explosions. The study of radioactive products from industrial nuclear processes was concentrated on the search for natural mineral materials which will safely hold long-lived isotopes such as radiostrontium and radiocesium for future utilization, without meanwhile endangering underground water supplies. Problems of clay conditioning for absorbent use were solved, and experimental work on use of the minerals crandallite and vermiculite for absorbing radioactive isotopes was done.

Research in stratigraphic paleontology by Survey specialists resulted in the publication of 62 reports during the year. Many field

The study of the effect of radioactive substances requires careful handling of materials, as shown here in a tracer test conducted in a glove box.



parties were also visited by the specialists who supplied them with on-the-spot fossil determinations, thereby expediting solution of field problems.

Alaskan Mineral Resources

Alaskan activities were directed primarily toward appraising and aiding in the discovery and development of mineral resources, as well as toward providing the needed geologic basis for industrial and agricultural expansion. About 850 miles of detailed geologic mapping and 34,000 square miles of reconnaissance mapping by ground and photogeologic methods were completed.

Field work on petroleum investigations was completed in two areas and reports were in preparation on three others. Preparation of a summary report on Alaskan coal resources continued, and a map of coalfields of Alaska neared completion. Detailed studies were continued in the Tofty-Eureka gold and tin district, and reports on tungsten areas north of Nome and tin deposits of western Seward Peninsula were in preparation. Studies of the applicability of geochemical prospecting techniques in northern latitudes continued. Preparation of four commodity maps showing the occurrence and distribution of 13 metals were completed. Geologic and geophysical studies at Cape Thompson, under Operation Plowshare of the Atomic Energy Commission, were continued.

Engineering geology investigations included mapping of surficial deposits near Fairbanks, site examination at military installations, and preparation for the Bureau of Public Roads of a reconnaissance map along possible routes of a Fairbanks-Nome highway. Analysis of thermal data obtained over a period of several years is aiding in the solution of many construction problems.

Aeromagnetic and gravity data were obtained in several potentially petroliferous areas of Alaska. These data will provide additional subsurface geologic information as a guide for oil and gas exploration.

Military Geology

During 1959 reports on terrain analysis of U.S. and foreign areas were prepared for the Corps of Engineers, U.S. Army, by scientists in the Survey's Washington office. Numerous advisory services were provided on the military aspects of the geology of foreign, territorial, and domestic areas. Technical assistance to the U.S. Army Corps of Engineers in Germany and Japan was continued.

Survey reports on the water resources of Okinawa and Saipan and on the military geology of Truk were published by the Corps of Engineers. Preparation of eight additional reports on Okinawa, Yap, Tinian, Guam, Truk, Miyako, and Ishigaki, and of professional papers on Ishigaki, Guam, Truk, and miscellaneous topical subjects was continued.

Field surveys of geologic and associated terrain and permafrost conditions in Alaska were made in the Copper River Basin and the Valdez area. Terrain studies of the Kuskokwim area, Seward Peninsula, and the Arctic Slope were completed. A professional paper on the Kuskokwim area was transmitted for publication. The Survey, in cooperation with the permafrost program of the Cambridge Research Center, U.S. Air Force, and with the glaciological program of the International Geophysical Year, continued studies along the Arctic Coast near Barter Island and in the adjoining mountain area.

In addition to furnishing advice and studies to the Corps of Engineers, the Survey made field studies on problems in the Arctic, for the Air Force.

During the year, studies were begun on a "terrain" analysis of the moon. Investigations are being made of the feasibility of developing information on the physical characteristics and engineering properties of the lunar surface. Studies were also begun on the applications of military geology to nuclear warfare—primary attention being given to the ways in which soils, rocks and vegetation respond to the effects of nuclear weapons.

Foreign Geology

Fiscal 1959 marked the 19th year of Federal Geological Survey technical assistance to other nations under auspices of the Department of State. The intensity of Survey interest in and help to other nations in the training of geologists and the establishment of central geological services continued with the assignment of 52 mineral scientists to 15 countries.

Efforts have been directed along the following lines: (1) appraisal of resources in concert with our counterparts; (2) building and strengthening national central geological services through advice, consultation, and sharing of advances in methods and techniques in geologic research and investigation; (3) encouragement and direct assistance to geological departments in educational institutions in less developed countries; and (4) the dissemination of knowledge of geologic processes and the sharing of geological information

through the exchange of publications and joint publication of bilingual reports on the cooperative work accomplished.

In-the-field cooperative geologic studies continued with counterpart scientific agencies in Brazil, Chile, Peru, Mexico, Libya, Pakistan, India, Thailand, Formosa, Indonesia, and the Philippines. Technical advice in the field of mineral resources was also extended to the Governments of Ghana, Hashamite Kingdom of Jordan, Japan, Korea, Saudi Arabia, Turkey, Iran, Afghanistan, Nepal, Burma, Paraguay, and Netherland Antilles.

Eighty-nine participants from twenty-four countries, under sponsorship of the International Cooperation Administration, the Atomic Energy Commission, and the United Nations, received training in the Geological Survey's domestic program. The training was supplemented in most instances with specialized graduate work at American universities. Under the Survey's Foreign Participant Photogeology Seminar at Washington, D.C., 24 young geologists from 15 countries received 7 months' office and field orientation and guidance in geologic interpretation and use of air photographs.

Library

Supporting Geological Survey investigations, the Survey Library continues to build its research materials for the use of scientists and engineers.

The Library has been active in the effort to expedite the translation of useful Russian works. More Russian material is becoming available and a considerable number of translations have been made or procured.

Activity in the Geological Survey Library in Washington and its branches in Denver and Menlo Park are summarized as follows:

Activity	Washington	Denver	Menlo Park
Publications received:			
Books, pamphlets, periodicals and serial parts.....	24, 179	11, 595	14, 852
Maps and charts.....	2, 469	8, 075	5, 828
Loans for use outside of Library:			
Books and other texts.....	40, 851	10, 951	5, 741
Maps.....	2, 628	286	-----
Well logs.....	-----	1, 158	-----
Loans, Interlibrary:			
Items loaned.....	5, 627	1, 117	-----
Items borrowed.....	3, 657	1, 995	628
Readers and users of books and maps in the Library:			
Survey members.....	23, 497	19, 677	4, 622
Others.....	2, 630	1, 452	725
Cataloging:			
Books, pamphlets cataloged.....	11, 809	-----	-----
New cards filed in the catalog.....	35, 045	-----	13, 850
Cards amended.....	11, 423	-----	-----
Copy for cards sent to Library of Congress.....	350	-----	-----

Conservation Division

The Conservation Division classifies Federal lands as to mineral and water resources and supervises mineral-recovery under leases, permits, and licenses on Federal, Indian, and Naval petroleum reserve lands. A headquarters staff and a field staff of geologists and engineers make surveys, maps and reports dealing with water power, fuels, minerals, and chemicals essential to the economy of the United States; supervises mining and drilling operations to assure safe and economical production by private enterprise of coal, oil, gas, and other minerals; and supervises the operations of the Federal Petroleum Board.

Mineral Classification

From field offices in Alaska, California, Colorado, Montana, New Mexico, Oklahoma, Utah, and Wyoming, geologists made specific investigations which resulted in geologic reports and maps for use by the Survey itself, other bureaus of the Department of the Interior, and the public.

Maps and reports completed and released to public inspection in fiscal 1959 included geologic reconnaissance reports on foundation conditions at 18 prospective dam sites in Alaska and 13 in Oregon; structure contour map of the Maudlin Gulch-Temple Canyon-Danforth Hills oil fields, geologic map of Williams Fork Mountains coal field, geology of Coal Creek area, geologic map of Ragged Mountain coal area in Colorado; structure geology of Spence-Kane area, Little Sand Draw oil field, Sage Spring Creek oil field and vicinity, Teapot Dome and vicinity, and areal geology of West Sussex field in Wyoming; structure map of Cut Bank area and geologic road logs of routes in Montana.

A total of 33,623 cases were processed which included 8,191 cases involving the outright disposal of Federal lands, either with no reservation of minerals or with the reservation of one or more specified minerals, and 22,893 cases involving the Government's right under Federal leasing laws to lease a mineral substance from lands under its jurisdiction. This was a decrease of 2,226 over the number of similar cases for the previous year.

In addition, initial or revised definitions of 66 producing oil and gas fields containing Federal lands were issued; 315 unit-plan and participating-area proposals were appraised geologically; 23 determinations of the productive limits of producing oil and gas deposits as found to exist on August 8, 1946 were made; the fact

and geologic significance of 194 new discoveries of oil or gas made on or affecting Federal-land leaseholds were reported; the competitive sale of oil and gas leases on 29 parcels of public land was recommended; 55 appeals from decisions of the Bureau of Land Management affecting the disposal of Federal lands were reviewed and reported upon; and 331 miscellaneous reports on the mineral potentialities of specific lands for various agencies of the Federal Government were prepared.

Water and Power

Investigations were conducted to determine the waterpower and storage possibilities of streams and lakes on Federal lands. These duties were carried out from a central office in Washington, D.C., and four field offices located in Denver, Colo.; Sacramento, Calif.; Portland, Oreg.; and Tacoma, Wash. Investigatory work in Alaska was supervised from the Tacoma, Wash., office.

Field work during 1959 was directed mainly toward obtaining basic information on the waterpower resources and storage possibilities of Federal lands in those States. Field projects completed during the year, or in progress on June 30, include surveys on Healy Creek, Nenana River, Sweetheart and Virginia Lakes, Alaska; Eel, Kern, and Stanislaus Rivers, Calif.; Arkansas and Crystal Rivers, Colo.; Navajo River, Colo., and New Mex.; Lemhi River, Idaho; Chetco, Coos, Donner and Blitzen, Metolius, Pistol, Sixes, Siletz, and Silvies Rivers, Oreg.; and the Entiat, Snoqualmie, and White Salmon Rivers, Wash.

The foregoing projects include about 590 miles of stream channel surveys and 21 damsite surveys. These projects normally extend over a 3-year period from start to map publication; for the current year the work completed would be the equivalent of about 370 miles of channel surveys and 20 damsite surveys.

As of June 30, maps resulting from previous field work were in various stages of preparation for publication for about 400 miles of stream topography and 9 damsites. Maps published during the year covered 96 miles of streams and 12 damsites. Maps completed and awaiting publication cover 276 miles of streams and 22 damsites.

Two reports were approved during the year for open file release. In keeping with the program of making a systematic review of waterpower withdrawals, 14 reports were prepared which resulted in recommendations for the outright restoration of 113,000 acres, and the restoration under provisions of section 24 of the Federal Power Act of 77,000 acres of previously withdrawn lands. Eighty-

four reports relating to water resources by other agencies were reviewed in the Washington office.

Classification activities resulted in the addition of 84,789 acres in power site reserves and the elimination of 68,388 acres, leaving outstanding reserves in 23 States and Alaska of 7,222,063. Reservoir site reserves were reduced by 2,310 acres and now total 131,593 acres. Prepared and submitted to the Bureau of Land Management were 256 reports on the waterpower value of lands affected in applications for rights-of-way and 8,341 reports on applications for land acquisition. Fifty-seven reports on cases affecting power site lands were prepared and submitted to the Federal Power Commission.

Mining

Mining supervisory operations were concerned with the discovery, development, and production of coal, potassium, sodium, phosphate, and oil shale from public lands; of sulphur on public lands in Louisiana and New Mexico; of silica sand on certain lands in Nevada withdrawn by Executive Order No. 5105; of gold, silver, and mercury on certain Spanish land grants; of all minerals, except oil and gas, on restricted, allotted, and tribal Indian lands and on "acquired lands."

Outstanding mineral leases and permits on "acquired" and Indian lands involve the exploration for and production of copper, gold, iron, lead, manganese, silver, nickel, titanium, tungsten, uranium, vanadium, zinc, asbestos, bentonite, clay, coal, garnet, gravel, gypsum, feldspar, fluorspar, limestone, mica, phosphate, pumice, quartzite, quartz, crystal, sand, silica sand, sulphur, and vermiculite.

Mining supervision includes responsibility for investigating and reporting on applications for leases and prospecting permits; recommending lease terms, enforcing compliance with lease terms and regulations governing the conduct of prospecting, mining, and beneficiation; protecting and conserving the natural resources by preventing waste; determining royalty liability; preparing statements and receiving payment of royalties and rentals.

As of June 30, 1959, there were under supervision 4,018 properties involved in leases, permits, and licenses in 34 States, of which 2,573 were on public land, 336 on acquired lands, and 1,109 on Indian lands. Annual production from such lands under supervision during the fiscal year is estimated at 26,159,403 tons, valued at \$170,027,891 with royalties amounting to \$7,831,504.

The production of coal from public domain lands in the United States aggregated 4,524,902 tons, valued at \$28,377,381 with a royalty

value of \$574,181. Potash production amounted to 13,984,156 tons of crude and refined salts valued at \$83,240,815 and royalty value of \$3,177,575 during the fiscal year..

The principal source of sodium was Searles Lake, Calif., accounting for 664,908 tons of the total of 954,460 tons of sodium and associated compounds produced from lands under supervision. Total value and royalty value of sodium were \$24,692,564 and \$813,309, respectively.

Phosphate rock and shale production was 2,107,687 tons—1,012,193 tons from public domain valued at \$3,418,304 with a royalty value of \$216,856; 1,860 tons from acquired lands, and 1,093,634 tons from Indian lands with a combined total value of \$1,298,500 and royalty value of \$129,531.

Production of lead and zinc concentrates from Indian lands amounted to 46,095 tons valued at \$111,236 and royalty value of \$9,647. The output of uranium and vanadium ores from Indian lands was 1,567,028 tons valued at \$22,912,711 and royalty value of \$2,582,703. Coal, sand and gravel, and other road surface materials made up the major part of the remainder of the production from lands totaling 2,523,243 tons valued at \$3,544,685 and royalty value of \$258,513.

Clay, coal, feldspar, fluorspar, zinc, asbestos, limestone, phosphate, mica, manganese, quartzite, quartz crystal, stone, and sand and gravel were produced from acquired lands in 12 States to an aggregate of 425,674 tons valued at \$2,397,781 and royalty value of \$68,541.

Oil and Gas Leasing

Supervision of oil and gas leasing activities includes operations for the discovery, development, and production of crude oil, natural gas and products extracted from natural gas, on Federal, Indian, and certain Naval petroleum reserve lands. These duties were carried out during the year through 6 area offices and 21 district offices at 21 separate locations in California, Colorado, Louisiana, Montana, New Mexico, Oklahoma, Wyoming, and Washington, D.C.

On the public lands, 130,619 oil and gas properties were under supervision at the end of the fiscal year, aggregating 107,420,140 acres in 23 States. Drilling on public lands during the the year included the spudding of 1,670 wells and the completion of 1,662 wells, of which 1,069 were productive of oil and gas. In all, 28,472 public land wells, including 16,851 capable of oil or gas production, were under supervision on June 30, 1959.

Production was appreciably greater than in fiscal 1958, amounting to about 145,030,000 barrels of petroleum; 442,976,000,000 cubic

feet of natural gas; and 308,926,000 gallons of gasoline and butane, with a total value of about \$460,708,000 and royalty returns to the United States of about \$57,248,000.

There were 6,404 acquired land leases embracing 4,652,603 acres in 31 States under supervision at the end of the fiscal year. Drilling on acquired lands during the year included the spudding of 89 wells and the completion of 71 wells, 28 of which were productive of oil and gas. In all, 778 acquired land wells, including 307 capable of oil and gas production, were under supervision on June 30. Including compensatory royalty allocated to the Rio Vista gas field the production from acquired land was about 5,317,000 barrels of petroleum; 29,843,000,000 cubic feet of natural gas; and 459,250 gallons of gasoline and butane, with a total value of approximately \$22,000,000 and royalty returns of about \$2,850,000.

Operations were supervised on 12,445 leaseholds, embracing 4,329,431 acres on Indian lands in 15 States. Drilling on Indian lands during the year included the spudding of 982 wells and the completion of 928 wells, of which 704 were productive of oil and gas. In all, 10,895 Indian land wells, including 6,524 capable of oil and gas production, were under supervision on June 30. The total production from Indian lands was valued at \$167,000,000 and revenues from rentals, royalties, and bonuses amounted to about \$37,208,000.

Drilling on military lands during the year included the spudding of one well and the completion of two wells, two of which were productive of oil and gas. In all, 102 military land wells, including 79 capable of oil and gas production, were under supervision on June 30. Royalty on the production of oil, gas, and liquid petroleum gases from military lands amounted to \$1,135,000 from a gross product value of \$8,000,000.

On behalf of the Department of the Navy, supervision was continued over operations for the production of oil, gas, gasoline, butane, and propane from 17 properties under lease in Naval Petroleum Reserve No. 2 in California. Production from 310 active wells totaled 3,250,000 barrels of petroleum; 4,400,000,000 cubic feet of natural gas, and 12,800,000 gallons of natural gasoline with a total aggregate value of \$12,200,000 and a royalty value of \$1,600,000.

On the Outer Continental Shelf 183 section 6 leases, originally issued by the States of Louisiana and Texas, aggregating 774,491 acres, and 197 leases issued under section 8 of the Outer Continental Shelf Lands Act, aggregating 696,660 acres, were under supervision. At the end of the fiscal year a total of 1,483 wells, 897 of which were productive of oil and gas, were under supervision. Drilling on the Outer Continental Shelf involved the spudding of 277 wells, and the completion of 287, including 219 producers. The production of

petroleum from the Outer Continental Shelf in fiscal 1959 was about 64 percent greater than during 1958 and the production of gas was about 95 percent greater than during 1958 with a total product value of about \$126,798,000. Revenues received during the year, as royalties and rentals, totaled \$24,811,000.

Activities toward unitization of oil and gas operations involving Federal land were reflected in the approval of 80 new unit plans during the year and the termination of 42 previously approved unit plans, leaving 373 approved plans covering 6,889,246 acres outstanding.

On the Outer Continental Shelf, no such plans were approved and one was terminated during the year. The total now stands at 12, embracing 311,399 acres. About 53 percent of the petroleum, 32 percent of the natural gas and 67 percent of the gasoline and liquid petroleum gas obtained from Federal lands during the year was produced under approved unit agreements. On Indian lands 12 new units were approved and one was terminated, the total number of plans in effect at the end of the year being 50, involving 81,757 acres.

There were 95 communitization agreements, or drilling units approved during the year, making a total of 876 outstanding as of June 30. There were four development contracts approved during the year. The total number of such approved contracts outstanding on June 30 was 11 involving 3,729,503 acres.

Connally Act Administration

The Connally Act of February 22, 1935, supports conservation activities of oil-producing States by prohibiting interstate shipment of oil produced in violation of certain State oil and gas conservation laws.

The act is administered by the Federal Petroleum Board under supervision and direction of the Geological Survey.

The Federal Petroleum Board consists of a chairman and one other active member on duty at the headquarters office in Kilgore, Tex. Suboffices are in Victoria, Tex., and Lafayette, La. Altogether there are 25 field employees of the Board.

While the Connally Act is applicable wherever State laws limit the rate of production and prescribe conditions for producing and handling oil, its chief application is in the States of Texas, Louisiana, and New Mexico, whose regulations prescribed under the act are enforced by the Board. With the limited resources at its command, the Board also enforces provisions of the act in other oil-producing States, particularly in Mississippi, Oklahoma, Arkansas, and Kansas.

Unless special exemptions are made by the Board in writing and by notice, all operators producing oil within the designated area are required to maintain daily production records and file monthly production reports of operations on each lease in the oilfield as prescribed; also transporters and refiners are required to file monthly reports with the Board at Kilgore. The designated areas consist of 106 counties in Texas, the counties of Lea and Eddy in New Mexico, and the entire State of Louisiana.

From these areas the Board regularly received and processed each month approximately 10,300 monthly producer's reports, about 460 monthly pipeline reports, and 65 reports from processors and refiners. These covered operations in 3,853 separate oilfields and accounted for approximately 51 percent of the entire production in the States of Texas, Louisiana, and New Mexico, some 4,129,000 barrels daily.

During this fiscal year the number of oilfields reporting rose from 3,700 to 3,853, an increase of 153. Reports on producing wells rose from 91,808 to 93,109, an increase of 1,301 wells. Some 5,681 leases were inspected, 1,347 leases were visited, and 6 pipelines were checked. To accomplish this, 783 oilfields were visited and 1,479 interviews conducted.

There were 10 cases of alleged violation of the Connally Act on the docket of the Federal Petroleum Board when the fiscal year began and ten new investigations were started.

Three cases were closed by court action during the fiscal year and one was closed as to corporations but remains open as to individuals. Fines paid during the year as a result of actions initiated by the Board amounted to \$58,250.

On June 30, 1959, of the 17 cases remaining on the docket, 8 were under investigation by the Attorney General, 8 were under investigation by the Board, and in the remaining case the Board had a report in preparation.

Topographic Division

The Topographic Division prepares and maintains the National Topographic Map Series covering the United States and its outlying areas. This involves operations in five major mapping phases: aerial photography, geodetic control, photogrammetric and field surveys, cartographic operations, and map printing. Related activities include research and development in instruments, methods and procedures, the preparation of special maps, and supplying Federal



Exacting and precise field survey work provides the basis for accurate mapping.

agencies and the general public with advance map materials, aerial photography, geodetic control lists, and map information.

During the year more than 1,700 new topographic quadrangle maps were published. Mapping projects were under way in every State, the District of Columbia, the Hawaiian Islands, Puerto Rico, and the Virgin Islands. More than 21,000 different topographic maps are now published and distributed by the Geological Survey.

Through the International Cooperation Administration, the Division extends technical assistance to accredited representatives of other nations. During fiscal year 1959, extended periods of technical training were provided to a civil engineer from Brazil, a geologist from Pakistan, and a mining engineer from Thailand.

Briefer individual training periods were provided for cartographers from Norway, Panama, and Sudan, and for a geologist from India. The Division also supported three Geological Survey photogeology training programs for foreign participants, by providing a concise basic week of instruction in photogrammetry. Tours of Division mapping facilities or discussion of its activities and techniques were arranged for about 60 foreign visitors.

Other foreign work consisted of continued preparation of the 1:500,000 scale series of Arabia and revision of foreign maps for the Army Map Service.



The detailed work of map control planning is illustrated here by a staff member of the Geological Survey.

With passage of Public Law 85-743 in August, 1958 extending Department of the Interior functions to Antarctica, long range plans were made for mapping activities on that Continent.

A survey engineer was assigned to Byrd Station, Antarctica for 18 months. He is to accompany scientific traverse parties and conduct geodetic surveys to determine positions of major peaks and other landmarks to be used for mapping control.

An experimental 1:1,000,000 scale map in the Knox Coast area of Antarctica was prepared and printed, including a shaded relief presentation. A comprehensive library of cartographic materials relative to Antarctica was established, including maps, photographs, and geodetic control data.

The need for a uniform series of topographic maps has been generally recognized since the earliest days of the Geological Survey. The continuing expansion in our economy and changes in the requirements of civil and military map users have broadened the fields of map use. A research study has been started and the results will be used to guide the Division in determining scale, content, and format of the maps to be produced in the national mapping program:

A new building to house Topographic Division activities at the Geological Survey center in Menlo Park, Calif. was substantially completed and employees began the transfer from Sacramento. Completion of the move to Menlo Park is scheduled for September 1959.

The function of staff assistance to the Board on Geographic Names for domestic names activities was assigned to the Geological Survey on October 1.

Mapping Programs and Map Production

Within the United States, nearly 355 permanently marked triangulation stations were established to provide control for areas totaling more than 30,700 square miles. About 6,840 linear miles of transit traverse, 3,100 miles of electronic traverse, and about 15,400 linear miles of leveling were run, with permanent marks established at intervals of 2 to 3 miles. The computed results of these surveys are made available, on request, to other Government agencies and to the public.

Contracts were let for 73,304 square miles of precision aerial photography for topographic mapping purposes. The Air Force

Sighting in a supplemental topographic control work at Bodie Pole, a cairn established more than a half century ago above what is now a California ghost town.





In a desert area east of the High Sierras in eastern California, engineers conduct control surveys for topographic mapping.

delivered aerial photographs covering 5,555 square miles for use in compiling topographic maps required by the Department of Defense.

During the year, 2,439 maps were sent to the Publications Office for printing and distribution. Of this number, 1,136 were new standard topographic quadrangles prepared by the Geological Survey and 104 were new maps compiled by other civil agencies but published and distributed by the Survey. Also included were 180 Geological Survey revisions, 509 reprints of existing maps, 16 one-color advance editions, and 85 State index maps. In addition there were 366 civil editions of maps which had been prepared by the Department of Defense for military use, and 25 miscellaneous maps prepared on special format or for research, administrative, and informational purposes.



Aerial photographs are used here to establish elevations south of Lee Vining, California.

A new 1:500,000 scale State map of Tennessee was printed. Compilation is in progress for new State maps of Maine, Minnesota, Montana, Nebraska, Nevada, North Dakota, South Dakota, Utah, and Washington.

The urban area map program continued with the printing of composite maps for Philadelphia, Denver, Norfolk-Portsmouth-Newport News, and Honolulu.

Several special mapping assignments were undertaken for other divisions of the Geological Survey and for other agencies. Included was the 1:1,000,000 scale series of North America for Army Map Service, special coded overlays for the Office of Civil and Defense Mobilization, rural route maps for the Post Office Department, a photomosaic for the Bureau of the Budget, cartographic assistance on a new edition of the United States Water Resource Development map, and a special compilation for the Interstate Commerce Commission.

During fiscal year 1959, cooperative programs were in effect in 34 States, Puerto Rico, and the Virgin Islands. Ohio, Tennessee, and Florida increased their programs. Total cooperative offerings during the year amounted to about \$2,000,000.

A detailed summary of map production is shown in the following table:

Areas (in square miles) mapped or revised during fiscal year 1959 for publication on standard scales

[Contour intervals, 5 to 100 feet]

State	Area mapped, scale		Area re- vised	Total
	1:24,000	1:62,500		
Alabama.....	1,163	1,241		2,404
Alaska.....		14,681		14,681
Arizona.....	246	2,106		2,352
Arkansas.....	225	944		1,169
California.....	3,778	3,177	153	7,108
Colorado.....	1,048	504		1,552
Connecticut.....			82	82
Delaware.....				
District of Columbia.....				
Florida.....	1,058			1,058
Georgia.....	826			826
Hawaii.....	356			356
Idaho.....	343	1,063		1,406
Illinois.....	636			636
Indiana.....	2,457		524	2,981
Iowa.....				
Kansas.....	2,261	75		2,336
Kentucky.....			1,116	1,116
Louisiana.....	290	2,812		3,102
Maine.....		286	265	551
Maryland.....				
Massachusetts.....			465	465
Michigan.....	108	4,775		4,883
Minnesota.....	1,329	1,647		2,976
Mississippi.....	47	1,275		1,322
Missouri.....	1,887			1,887
Montana.....	2,024	1,608		3,632
Nebraska.....	1,226			1,226
Nevada.....	1,233	2,987		4,220
New Hampshire.....			431	431
New Jersey.....				
New Mexico.....	616	2,239		2,855
New York.....	439	332	73	844
North Carolina.....		1,101		1,101
North Dakota.....	1,712			1,712
Ohio.....	1,150		2	1,152
Oklahoma.....	60	1,025		1,085
Oregon.....		660		660
Pennsylvania.....	932			932
Rhode Island.....				
South Carolina.....	776	427	45	1,248
South Dakota.....	660	182		842
Tennessee.....	634		86	720
Texas.....	5,331	2,149		7,480
Utah.....		2,604		2,604
Vermont.....				
Virginia.....	25			25
Washington.....	874	721		1,595
West Virginia.....	989			989
Wisconsin.....	645	475		1,120
Wyoming.....	774	3,218	440	4,432
Total.....	38,158	54,314	3,682	96,154
Puerto Rico.....			250	250
Virgin Islands.....				
Total.....	38,158	54,314	3,932	96,404

¹ 1:63,360.

² 1:20,000.

Research and Development

Research and development in instruments, methods, and procedures was expanded in all phases of map preparation by introduction of

operational-type research in the four area offices and the Branch of Special Maps.

A new signal lamp has been developed for use in field surveys. An efficient two-transistor circuit causes the lamp to flash at constant intervals. This permits the signal to be identified under difficult daytime conditions of observation and precludes sighting on the wrong light source or on an image from light reflecting objects in the same general area.

The new four-wheel-steer elevation meter was used on several operational projects. The meter obtains supplemental control elevations in a fraction of the time required by other accepted methods, but its use is limited to projects with a good distribution of traversable roads and of sufficient area to provide a large volume of work.

Using new electronic distance-measuring equipment for control surveys produced a remarkable increase in accuracy attainable at greatly reduced cost.

New photographic emulsions commercially available during the year were tested. One of the new emulsions showed considerable improvement in quality and was adopted for use on all aerial photography projects.

Research was continued on the development and testing of the "direct geodetic restraint method," a completely analytical system of aerotriangulation. The results of tests to verify the geometrical approach and correctness of the electronic computer program indicate that the system can attain a high degree of accuracy with ideal photographs and control.

Tests also were made of horizontal and vertical block adjustments of aerotriangulation by means of the Jerie-International Training Centre analogue equipment. This was developed in Delft, The Netherlands, and uses an ingenious new method to adjust discrepancies in positions and elevations. After successful completion of the tests, procurement of the equipment was undertaken.

The Survey cooperated with the Engineer Research and Development Laboratories, Corps of Engineers, in a project to test the accuracy of the Decca system in determining exact positions of an airplane for a series of exposure stations and for other purposes.

The long-range plan for designing, developing, and procuring high-precision photogrammetric instruments to replace the Multiplex has been completed. More than 300 photogrammetric units are now in operation, a major percentage of them of a type designed and developed in the Topographic Division. The instrumentation includes means for map compilation from vertical and oblique aerial photographs.

Modifications of the Twinplex instrumentation are nearing completion and a new system has been developed for calibration. This system and certain mechanical modifications promise a higher accuracy potential needed for successful horizontal and vertical stereo-triangulation of twin low-oblique photography.

Building a prototype of the universal model of the Orthophotoscope began. The new model of this instrument has been designed to use a high degree of automation applying electronic read-out devices. It will accommodate any dichromatic projection equipment now in use. A simpler, less costly, standard model has been designed which will provide satisfactory orthophotographs under most conditions of terrain and photography, using only ER-55 projectors.

Research and development continued on improving the efficiency of map-finishing techniques. This included design of new register punches, use of the dye scribe technique to speed up the map revision process, design of new elevation figure plates, and development of new and improved scribing instruments.

Map Information

Facilities for supplying information on maps, aerial photography, and geodetic control surveys to Federal, State, and local government agencies, and to the public are maintained at the Map Information Office in Washington and at the Division's field offices. Services include over-the-counter map sales for the convenience of the public, commercial firms, and Government agencies; sale of prints of advance materials from current topographic mapping; assembly of special maps, photographic and geodetic control data to meet the requirements of Federal agencies; and the preparation of maps showing the current status of mapping and aerial photography.

The Map Information Office continued to serve as the central depository for maps which make up the National Atlas of the United States and provide economic, physical, and cultural information.

Water Resources Division

The Geological Survey is responsible for determining, appraising, and describing surface and underground water resources to aid in the solution of national water problems. The great impact of present day water problems is felt in its field offices throughout the country where information based on the results of investigations is supplied to answer thousands of requests each year. With ade-



Geological Survey physicist inspects thermocouples on meteorological equipment in Nebraska.

quate knowledge, conservation and sound management of available supplies is possible.

Water-resources investigations include the systematic collection, analysis, interpretation, and publication of hydrologic and related geologic data; appraisal of water resources of specific areas; study of water requirements for industrial, domestic, and agricultural uses; and research and development to improve the scientific basis and techniques of investigations. The results appear as scientific or technical reports and papers. During fiscal year 1959, the Division published 71 water-supply papers, 8 circulars, and 4 professional papers. In addition, 62 reports were placed in open file, and 260 manuscripts were approved for publication in scientific journals.

The program of water-resources investigations is a coordinated effort between Federal, State, and local agencies. Federal-State cooperative investigations began in 1895 and this kind of work has grown steadily, now constituting about 60 percent of the total program. Funds made available by States and municipalities in 1959 for cooperative investigations include:

*State and Municipal Offering for Cooperative Water Resources
Investigations*

State	1959	State	1959
Alabama.....	\$184,378	Nebraska.....	\$107,988
Alaska.....	7,375	Nevada.....	52,546
Arizona.....	210,035	New Hampshire.....	18,857
Arkansas.....	76,907	New Jersey.....	160,411
California.....	705,090	New Mexico.....	252,089
Colorado.....	151,094	New York.....	354,653
Connecticut.....	47,540	North Carolina.....	174,206
Delaware.....	52,929	North Dakota.....	74,495
Florida.....	318,879	Ohio.....	197,777
Georgia.....	159,105	Oklahoma.....	99,005
Guam.....	15,000	Oregon.....	106,447
Hawaii.....	150,271	Pennsylvania.....	201,077
Idaho.....	67,513	Puerto Rico.....	49,762
Illinois.....	94,748	Rhode Island.....	37,225
Indiana.....	182,995	Samoa.....	5,250
Iowa.....	87,744	South Carolina.....	38,305
Kansas.....	136,205	South Dakota.....	56,505
Kentucky.....	165,877	Tennessee.....	111,411
Louisiana.....	195,064	Texas.....	430,069
Maine.....	20,492	Utah.....	200,753
Maryland.....	67,797	Vermont.....	12,464
Massachusetts.....	72,286	Virginia.....	22,077
Michigan.....	114,455	Washington.....	174,638
Minnesota.....	161,130	West Virginia.....	34,576
Mississippi.....	89,705	Wisconsin.....	74,694
Missouri.....	47,446	Wyoming.....	93,432
Montana.....	73,199		
		Total.....	6,795,971

Fiscal year 1959 saw a widening interest in coordinated comprehensive planning of water resources development. For this purpose, Congress established two river basin study commissions. The Senate established a select committee to study the development and coordination of water resources. Also evident in 1959 was the growing nationwide interest in water quality. Concern about the effect of radioactive fallout on our water resources was front page news for example. Less publicized, but equally timely, was the recognition of water-quality down-grading in some areas, caused by discharging domestic, industrial, and agricultural wastes to streams and sub-surface reservoirs.

The following water problems are of paramount importance in the nation today and involve aspects that are definite responsibilities of the Geological Survey:

1. Impact of a growing and shifting population on water supplies, accompanied by an accelerated increase in water requirements for industrial and agricultural developments.

2. Limitations on water development and use brought about by radioactive and chemical waste disposal from municipalities, industries, agriculture.

3. Effects of land use practices and urban development upon existing water supplies.

4. Water losses through evaporation and inability to capture surplus runoff for later use.

5. Contamination of fresh water supplies by salt water intrusion in adjacent coastal and inland areas.

6. The need to determine sources, character, and potential of surface and ground waters of marginal chemical character that might be suitable for application of saline water conversion methods.

7. Legal questions arising out of laws on water rights, flood zoning and insurance, or compacts between States.

8. Floods and the need for adequate design and operation of flood control structures, forecasting flood stages and volumes, and enactment of flood zoning and insurance regulations.

Surface Water Investigations

Streamflow and other surface-water data were obtained at 7,100 sites distributed throughout the 49 States and Hawaii, Guam, Samoa, and Puerto Rico. A special summary of all streamflow records for the period 1888-1950 is 98 percent complete. The reports for the South Atlantic slope basins (James River to Savannah River), St. Lawrence River basin, the Great Basin, and for several Pacific slope basins were published.

Flood-frequency analyses for New England and for the Colorado River basin, part of a nationwide study of regional flood frequency, were completed. Pending completion of the nationwide study, the Division is making preliminary State-wide analyses in cooperation with several State agencies. Analyses were completed and reports were released to the open files for Ohio, North Dakota, South Dakota, and Florida. A report on the Delaware River Basin flood frequency was also released.

Three flood reports were published as water-supply papers or circulars:

Summary of Floods in the United States during 1952

Floods of October 1954 in Chicago area, Illinois and Indiana

Floods of June-July 1957 in Indiana

Work is in progress on several other flood reports including floods of January-February 1959 in Ohio and Indiana.

Runoff studies of maximum annual floods were made for 1,426 areas, all for drainage areas of less than 400 square miles, at the request of the Soil Conservation Service. Hydraulic data for 38 drainage-structure sites were furnished to highway departments in 11 States.

A manual of hydrology was started, describing the techniques in surface-water hydrology that are used by the Survey. The manual will be published as separate chapters, each chapter dealing with a



Survey geologist conducts velocity measurements as one step in determining the water discharge of a stream.

specific technique. During the year, six chapters were approved for publication.

Interstate compacts for the apportionment of interstate waters usually include provision for measurement of streamflow, commonly by the Geological Survey. Nineteen such compacts are in effect and five others are under negotiation. Water-resources investigations were continued along the Canadian boundary, as required by the Boundary Water Treaty of January 11, 1909, between the United States and Canada, or by order of the International Joint Commission.

Ground Water Investigations

The major part of the program of ground water investigations for fiscal year 1959 consisted of studies or appraisals of the ground water resources of specific areas in different parts of the 49 States, Hawaii and Puerto Rico.

During fiscal year 1959, work progressed on 640 ground water projects. Cooperative investigations supply many local needs for water facts. However, such water sources as rivers and water-bearing formations are independent of political boundaries and Federally financed programs must supplement cooperative work in local areas. The work in the Mississippi Embayment, a project encompassing some 90,000 square miles in parts of nine States with a common major ground-water basin subject to intense development of water for industrial, municipal, and agricultural use, is such a project that continued during fiscal year 1959.

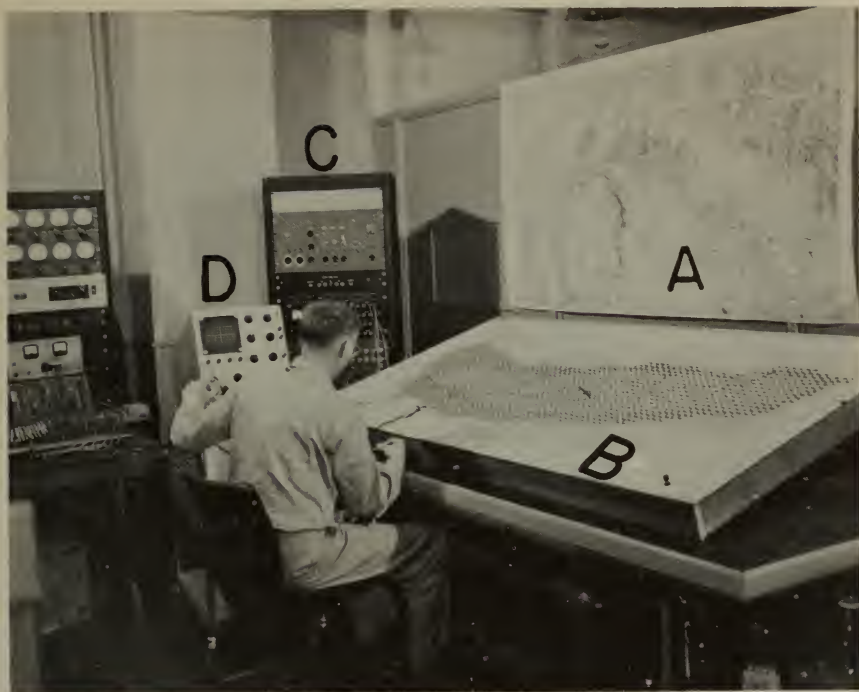
A start was made on the hydrology of basalt terranes, a study of a typical area to uncover new methods for finding and developing ground water in the Pacific Northwest. Principles developed from this study will be applicable to any area underlain by similar geologic and hydrologic conditions. Another type of study, equally valuable, is a series of projects on salt-water encroachment in coastal areas of the Nation. Of particular significance are salt-water studies in progress in Hawaii, in eight States in the Southeast and in seven Northeastern States.

In the search for new tools and techniques with which to approach water problems of the future, a research team completed work on two analog computers into which can be placed geologic and hydrologic data and from which data can be obtained regarding the response in water-bearing formations to water withdrawal or injection. This approach offers great promise in the investigation of hydrologic systems.

Chemical Quality of Water Investigations

Basic investigations of the chemical character of water supplies in the United States were continued in 1959. Supplementing the nationwide programs were more detailed studies of water-quality conditions in the basins of the Colorado, Missouri, Pecos, Columbia, Connecticut, and Yadkin-Pee Dee Rivers, and in Alaska. Included as part of ground-water programs was the assessment of chemical quality of underground supplies.

The program included the beginning of studies of the distribution and concentration of radioactive waste in streams by fluvial sediment. A modest start was made in measurements of synthetic detergents as related to the quality of ground water supplies in the United States. Studies continued on worldwide runoff of dissolved solids from land surfaces to the oceans. Study continued of the significance and potential use of tritium as a tracer and age determinant in water investigations.



Electrical model for predicting effects of ground-water pumping: (a) geologic map of typical arid basin; (b) electrical model simulating hydrologic properties of basin; (c) equipment for varying flow of electric current to simulate ground-water flow; (3) oscilloscope for observing instantaneous "ground-water conditions" at selected points.

Among reports prepared were those on the chemical quality of surface waters of South Dakota with special reference to selenium, boron, and fluoride; a study and interpretation of the chemical characteristics of natural water; a survey of analytical methods applicable to the determination of strontium in natural waters; and distribution of uranium and radium in ground waters of the United States.

Sediment Investigations

Studies of sources and movement of sediment in streams were carried on in 1959. Detailed work in the Missouri, Colorado, and Middle Rio Grande Basins included measurement and analysis of sediment loads and related factors important to the extensive Federal programs of water use in these areas.



Geological Survey hydraulic engineer using a battery-powered cable car and sounding equipment to make streamflow measurements from a steel cable high above the Columbia River.

Other studies include the relationship of sediment transport to roughness and shape of stream channels; bedload discharge of sediment; development of automatic equipment for measuring sediment discharge of streams; and improved techniques and standards for analyzing and interpreting sediment data and records.

Investigations of sediment yields and trap efficiency of reservoirs in small watersheds continued in collaboration with the Soil Conservation Service. Sediment studies were made for the Bureau of Reclamation in the Rio Grande and Colorado River Basins and for the Soil Conservation Service in the Medicine Creek Watershed of Nebraska.

A comprehensive study of the Delaware River basin, which began during fiscal 1957, was completed and chapters on ground-water occurrence, geology, and sediment have been delivered to the Corps of Engineers, to be included in their comprehensive plan of development for the basin. Additionally a hydrologic atlas and a professional paper were prepared for Survey publication to document the results of this investigation. A similar study of the

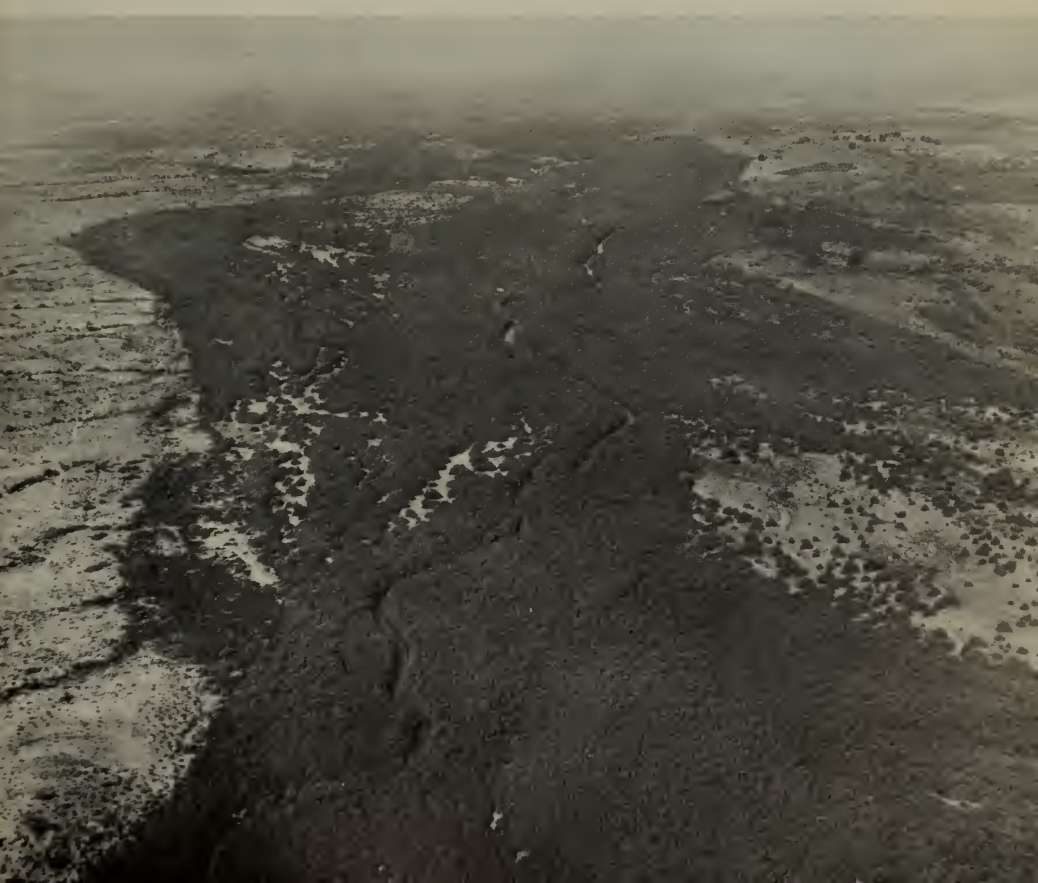
hydrology of the Colorado River basin above Lees Ferry, Ariz., was continued during the year and scheduled for completion during 1961. All aspects of the occurrence, use and availability of water are being covered with special emphasis on chemical quality and the interrelationships between surface water and ground-water supplies.

A report on water requirements of the copper industry will soon be printed. Similar reports on the petroleum industry, steel and synthetic rubber are in progress.

Manuscripts on the water resources of metropolitan areas of Los Angeles, Calif.; Syracuse, N.Y.; and Springfield, Mass., have been completed and publication is expected early next year.

Work continued on a series of publications which will summarize knowledge about the water resources of each State. Drafts of manuscripts are complete or have been started for Alabama, Ari-

Work toward reducing phreatophytes (water-loving weeds) that grow in many stream valleys is one of Geological Survey's activities contributing to water conservation in the arid West.



zona, Delaware, Georgia, Idaho, Oklahoma, Oregon, and Rhode Island.

In the interest of conserving water and to reduce flood hazards in sections of the arid West, scientists are studying the problems of phreatophytes (water-loving plants) that grow in many stream valleys. In addition to wasting large quantities of water through evapotranspiration, these plants develop a junglelike growth that invades and chokes the normal overflow channels of streams. Flood waters back up and spread out on adjacent farmland. Projects are now underway to determine the effect and economic feasibility of eradicating large areas of these weeds.

Soil and Moisture Conservation

Continuing activities included investigations of hydrologic and geologic conditions on public lands to provide data needed by other bureaus of the Department of the Interior for the management of those lands. Investigations were made of water supplies in grazing areas in Utah, Nevada, Idaho, and California. Data on runoff and sediment yields were collected for reservoirs constructed as part of the conservation program on public lands in Montana, Wyoming, Colorado, Utah, New Mexico, and Arizona. Studies in stream morphology, aggradation and degradation were made in Arizona, Nebraska, and Wyoming.

Research and Development

Increasing demands upon the country's water resources, irrespective of their origin, require, as a byproduct, an increasing technical proficiency in delineating the magnitude of the resource, devising procedures for its use, and anticipating the effects of different management practices. To fulfill its responsibility for technical aspects of our water resources and the hydraulics of natural channels, the Geological Survey conducts an active research and development program.

A more complete evaluation of the water available from our Nation's streams requires an increased number of gaging stations. This demand, in turn, has led to an intensive search for new and better instruments for measuring the flow of water in channels and for new procedures for the processing and analysis of data. The objective of these efforts is to reduce cost, increase the speed with which streamflow data can be made available to the public, and present such data in their most useful forms.

More intensive use of surface waters has resulted in demands for greater knowledge of the hydraulics of open channels, and of

the physical behavior of water and sediment in stream systems, including those subject to tidal flow. Such demands are being met by special investigations in the field, coupled with investigations in laboratory flumes and conduits.

In many areas the more intensive use of water is leading to conflict between users. Special studies have been undertaken to aid their solution. Those now under way seek to learn the effect of land management and other conservation practices on the quantity and quality of water at locations downstream from treated areas. Another important Survey study in this field is the effectiveness of adding chemical films to reduce evaporation.

While the great ground-water reservoirs which yield so much of our domestic and municipal water supplies appear to lend themselves to management, a great deal is yet to be learned regarding the movement of water through porous media below ground.

Use of water always modifies its quality. Thus while the chemistry of water must be completely defined, there is much to be learned about the behavior of water solutes. Problems of radioactive waste disposal and the use of radioactive elements as tracers are increasing the need for research in this field. Studies are under way of the chemistry of iron in water, of exchange phenomena and chemical reactions of radioactive substances, of the geochemistry of trace elements in water, and of the mineral constituents in ground water and their genesis.

Technical Assistance Program

Activities under auspices of the International Cooperation Administration's Technical Assistance Program continued at about the same level during fiscal year 1959. Long-term projects were carried on in Afghanistan, Chile, Iran, Libya, Pakistan, Philippines, Peru, and Saudi Arabia. Personnel were assigned for short periods to Cambodia, British Guiana, Philippines, Tunisia, and Turkey to assist in modernizing or expanding surface- or ground-water resource investigations.

Technical assistance given continued to emphasize establishment or strengthening of foreign governmental organizations engaged in water resource investigations. On-the-job training in methods and techniques and advisory assistance in organizational phases are the principal mechanisms of this assistance. Survey personnel gave in-country training to more than 100 citizens of nations where long-term projects are being conducted. Citizens of Afghanistan, Brazil, British Guiana, Chile, Guatemala, India, Pakistan, Philippines, Taiwan, Tanganyika, and Turkey received training in the United States.

Publications

Information on the physical features of the country and facts necessary for the exploration, development, and conservation of our mineral and water resources are developed through investigations, surveys, and research, the results of which are made available by publication of a variety of reports, maps, and charts.

The information is published in part by the Survey, in part by cooperating States, and in part by many scientific journals. These publications include maps of the topographic and geologic features of the Nation, studies of mining districts and mineral deposits, of the composition and structure of rocks and minerals, of fossils and the rocks in which they are found, of geophysics and geochemistry, and studies of streamflow, ground waters, and their chemical quality.

During the fiscal year, 1,015 reports including geologic and hydrologic maps were submitted for publication. Of these 288 were for publication by the Geological Survey, 40 as professional papers, 58 as bulletins, 71 as water-supply papers, 13 as circulars and 106 in the various map series, the balance, 727 were for publication by cooperating agencies or by scientific journals.

Preparation

In this period, 193 new manuscripts were sent to the printer and 182 were published. Work on new manuscripts prepared in fiscal year 1959 included editing and preparing for printing some 35,157 pages of manuscripts; checking 4,724 galley proofs and 7,876 page proofs. Indexes compiled consisted of 25,461 entries. Printed reports delivered included 28 professional papers, 67 bulletins, 61 water-supply papers, 8 circulars and 18 miscellaneous items.

Technical Illustrations

During fiscal year 1959, illustrations for 239 new reports were completed and sent to the printer. This number consisted of: 67 bulletins, 37 professional papers, 23 water supply papers, 8 circulars, 100 geologic map series, and 4 geologic map series reprints. An additional 40 illustrations were completed for various administrative reports, open-file reports, outside publications and miscellaneous services.

Work is progressing on three maps of special interest, namely a revised Geologic Map of North America, a revised Tectonic Map of the United States, and a reprint edition of the Geologic Map of the United States.

Map Reproduction

Final reproduction of maps and charts as well as many of the multicolor illustrations in the book reports prepared by the Geological Survey require photography, lithography, and related techniques performed in the map reproduction plant of the Survey.

Materials submitted for reproduction are routed through the various operational steps which consist of line and halftone photography, plastic and metal plate preparation, lithographic offset press printing and finally the trimming and finishing of the completed publication.

The ever increasing demands for published information require careful analysis of present and future printing and publication requirements, as well as constant research and sound management practices. These efforts have resulted in the streamlining of operations, the installation of high speed and larger equipment, and the modification of procedures and materials involved in the publication of both new and revised or reprinted maps and charts.

Also, new materials and procedures have been adopted in the servicing of field projects which have resulted in improving the efficiency of both field operations and subsequent cartographic and lithographic operations. Permanency of the printed record is of extreme importance. In this respect, a constant upgrading of lithographic inks, papers, and photographic material and their compatibility not only with each other, but with usage, storage and the elements, receive continued investigation and study. The following is a summary of map reproduction work completed during the year:

	New	Reprinted
Topographic Division maps:		
Standard topographic.....	¹ 1, 716	² 278
Standard topographic (engraved).....	1	186
Standard topographic (revisions).....	195	
1 : 250,000 scale.....	101	11
Scale conversions.....		135
Planimetric.....	5	7
State base.....	4	4
State topographic indexes.....		77
Miscellaneous.....		8
Geologic Division maps:		
Geologic quadrangles.....	10	
Mineral investigations.....	34	
Geologic indexes.....	3	
Coal.....	1	1
Oil and gas maps.....	5	1
Oil and gas charts.....	3	1
State geologic.....		1
Geophysical investigations.....	21	
Geologic status.....	4	3
Miscellaneous investigations.....	29	3
Conservation Division:		
River Survey.....	6	
Total.....	2, 138	716

¹ Includes 14 printed by other Government agencies.

² Includes 7 printed by other Government agencies.

These 2,854 new and reprinted map editions comprise 9,652,327 copies of which 9,615,032 copies were printed in the Survey's plant. These maps range in size from 13 by 18 inches to 50 by 72 inches.

In addition to the foregoing production, 1,250 jobs comprising miscellaneous maps and other preliminary map services were completed. This printing includes 354 maps amounting to 1,703,341 copies of which 162 were illustrations comprising 565,971 copies for the Government Printing Office for use in the Survey's book reports. The rest of the miscellaneous printing and service was done for other units of the Government, including branches of the Survey and various States. Also 2,879 type jobs (impressions on cellophane for map preparation) were delivered, and 826 maps were mounted on cloth.

The total cost of all production was \$1,621,675.65. Of this amount \$45,890.45 was received from other agencies for map sales and \$60,519.75 was paid by other agencies and miscellaneous organizations for printing or service work.

The summary of work performed in the Survey's plant includes: Reproduction and delivery of 11,318,373 map copies (53,030,123 impressions); preparation of 15,562 photolithographic printing plates, ranging in size from 24 by 30 inches to 55¾ by 73 inches; 4,705 photolithographic negatives; 44,783 photographic negatives and positives ranging from 2 by 4 inches to 40 by 80 inches; 10,956 prints ranging from 1½ by 2 inches to 40 by 80 inches; developed and printed 75 rolls of film; processed 19,869 sheets of strip film; and prepared 500 lantern slides.

Distribution

Geological Survey reports and maps are distributed by mail from bulk stocks at Silver Spring, Md.; Denver, Colo.; and Fairbanks, Alaska. Direct over the counter sales are made from these and other specially designated locations.

In addition to more than 40 million items on hand at the beginning of the year, 313,746 copies of 188 separate reports in book and pamphlet form, which were printed by the Government Printing Office and the Interior Duplicating Section, were received. Also received were 9,652,327 copies of 2,854 new and reprinted maps.

The distribution of approximately 4,312,600 maps, including map indexes, constituted a substantial increase of some 543,200 copies over the corresponding total for the preceding fiscal year. Approximately 251,950 book reports and pamphlets were distributed by the Survey during fiscal year 1959. In addition, slightly more

than 121,400 copies of the Survey's monthly announcement of new publications were distributed by the Superintendent of Documents.

This total distribution was implemented in compliance with 218,300 individual requests and resulted in the collection of \$535,096.69 from the sale of maps to the public, which amount was deposited as miscellaneous receipts in the United States Treasury. Free distribution of maps for official, educational, and Congressional use was approximately 28 percent of all maps distributed.

The total number of copies distributed by the Geological Survey during this year as compared with last is shown in the following table:

	Fiscal year 1958 maps, map indexes and book re- ports	Fiscal year 1959 maps, map indexes and book re- ports	Percent of increase or decrease
Washington.....	2, 519, 350	2, 787, 158	+11
Denver.....	1, 240, 950	1, 452, 989	+17
Fairbanks.....	31, 000	38, 957	+26
Other field offices.....	270, 750	285, 447	+5
Total.....	4, 062, 050	4, 564, 551	+12

Public Inquiries Offices

Public Inquiries Offices have been established in the following cities: Dallas, Tex.; Denver, Colo.; Salt Lake City, Utah; San Francisco and Los Angeles, Calif.; and Anchorage, Alaska. These carry stocks of Survey maps and reports concerning their respective areas, answer inquiries, and direct specific questions on technical matters to appropriate Division technical officers. Maps and reports are sold over-the-counter, but the offices are not equipped to handle mail orders. Their operation facilitates distribution of the results of Survey investigations to the public.

Funds

During the fiscal year 1959, obligations were incurred under the direction of the Geological Survey totaling \$63,650,114. Of this amount 65 percent was appropriated directly to the Geological Survey, 20 percent was made available by other Federal agencies, and 15 percent by States or their political subdivisions, and miscellaneous non-Federal entities.

Source and use of funds in fiscal year 1959

Topographic surveys and mapping:

Appropriation		\$14,673,792
Reimbursements from non-Federal sources:		
States, counties, and municipalities	\$2,003,863	
Sales to the public of aerial photographs and copies of records	159,340	
Miscellaneous	39,706	
		2,202,909
Reimbursements from other Federal agencies:		
Bureau of Reclamation	804,372	
Department of the Army	1,235,000	
Miscellaneous	232,779	
		2,272,151
Total appropriation and reimbursements		19,148,852
Direct State payments		9,409
Total, topographic surveys and mapping		19,158,261

Geologic and mineral resource surveys and mapping:

Appropriation		11,345,540
Reimbursements from non-Federal sources:		
States, counties, and municipalities	\$310,264	
Miscellaneous	19,434	
		329,698
Reimbursements from other Federal agencies:		
Office of Mineral Exploration	290,615	
Department of the Air Force	161,300	
Department of the Army	1,298,772	
Atomic Energy Commission	2,216,608	
Government Printing Office—map reproduction	104,473	
International Cooperation Administration	1,106,007	
Miscellaneous	251,631	5,429,406
Total, geologic and mineral resource surveys and mapping		17,104,644

Water resources investigations:

Appropriation		\$11,277,879
Reimbursements from non-Federal sources:		
States, counties, and municipalities	\$5,663,314	
Permittees and licensees of the Federal Power Commission	210,102	
Miscellaneous	62,139	
		5,935,555

Source and use of funds in fiscal year 1959—Continued

Water resources investigations—Continued

Reimbursements from other Federal agencies :

Bureau of Reclamation	776,330	
Department of Agriculture	249,621	
Department of the Air Force	142,000	
Department of the Army	1,759,797	
Department of State	118,073	
Atomic Energy Commission	432,255	
International Cooperation Administration	498,044	
Tennessee Valley Authority	95,792	
Miscellaneous	346,253	4,418,165

Total appropriation and reimbursements	21,631,599
Direct State payments	1,132,657

Total, water resources investigations	22,764,256
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Soil and moisture conservation :

Appropriation	174,000
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Conservation of lands and minerals :

Appropriation	2,434,269
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Reimbursements from non-Federal sources :

Miscellaneous	1,020
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Reimbursements from other Federal agencies :

Office of Oil and Gas	\$212,491	
Miscellaneous	48,652	261,143

Total, conservation of lands and minerals	2,696,432
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General Administration :

Appropriation	1,273,000
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Reimbursements from non-Federal sources :

Miscellaneous	14,400
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Reimbursements from other Federal agencies :

Department of the Army	\$165,973	
Atomic Energy Commission	103,600	
Miscellaneous	195,548	465,121

Total, General Administration	1,752,521
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Summary :

Appropriation	41,178,480
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Reimbursements from non-Federal sources :

States, counties and municipalities	\$7,977,441	
Miscellaneous	506,141	8,483,582

Reimbursements from other Federal agencies	12,845,986
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Total, appropriation and reimbursements	62,508,048
Direct State payments	1,142,066

Grand total	63,650,114
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Bureau of Mines

Marling J. Ankeny, *Director*



IMPORTANT ADVANCES WERE MADE in virtually every phase of activity of the Department of the Interior's Bureau of Mines during the 1959 fiscal year. Outstanding among the noteworthy developments were:

Metallurgical achievements.—Pioneering experiments by Bureau scientists produced the world's first shaped casting of molybdenum metal, a feat that attracted widespread public interest and promised solutions for some of the many difficult problems encountered in the Nation's space-exploration and missiles programs. Other significant gains were made in laboratory production of high-purity tungsten and yttrium. Experimental work on hafnium moved rapidly toward development of a cheaper method for producing this metal for nuclear-reactor use.

As supplies of many commodities became more assured during the year, the Bureau turned attention to investigations of the properties of unusual minerals, uncovering new facts about such rare-earth metals as erbium, holmium, dysprosium, gadolinium, and neodymium. At the same time, research in light metals progressed with the Bureau beginning a commercial evaluation of its new electrolytic process for recovering high-purity titanium from scrap and other materials.

Conventional metals were not neglected, however. Research in steelmaking resulted in successful use of both natural gas and coal in the Bureau's experimental blast furnace, and other studies demonstrated that low-nickel austenitic stainless steel can be made from offgrade ores. Work advanced rapidly on the Bureau's segregation process for treating copper oxide and oxide-sulfide ores.

Studies of nonmetallic minerals included experiments with super-refractories which yielded new data on thermal decomposition of

cerium, lanthanum, and yttrium salts at temperatures up to 1,500° C., and new information was obtained on methods for upgrading fire clays to improve their refractory properties. Elemental boron was produced experimentally by several different techniques, and additional knowledge was gained on the structure of asbestos.

Mining research.—High-speed photography provided basic data on quarry blasting, and progress was made in physical studies of rock breakage by explosives. Information was published on methods and costs at stone quarries, mineral-aggregates mines, and metal mines. Studies aimed at utilizing submarginal deposits of phosphate rock were advanced and a new project was begun to evaluate the use of cavitation in breaking phosphate rock and other materials.

Studies of petroleum and natural gas.—Toward the end of the year, the Bureau completed its part in a long-range Departmental study to estimate future U.S. requirements of petroleum and natural gas, and to outline ways of assuring adequate supplies. In another cooperative project, radioactively "tagged" gas was injected into producing oil wells in the Spraberry Field of West Texas, as part of research to develop effective waterflooding techniques for this large oil-bearing formation.

The possibility of using nuclear explosives as an aid in obtaining oil from the extensive oil-shale deposits of the West was discussed at a meeting with petroleum and chemical companies, whose response to the Government's proposal for a cooperative test was generally favorable.

The Bureau's petroleum and natural-gas studies resulted in several important achievements, including a method that employs foaming detergents to remove unwanted water from gas wells, a portable battery-powered radiation monitor that can be used to detect radiation in areas where no central power is available, and a new apparatus that makes possible use of the metal, gallium, to gain higher accuracy in recording characteristics of petroleum and natural gas.

A major accomplishment of studies in petroleum chemistry was the first actual identification of a nonbasic nitrogen compound from petroleum. The compound, dibenzopyrrole, was separated by gas chromatography and identified by mass and infrared spectroscopy.

Health and safety progress.—Advances in mine safety during the year included commercial manufacture of a Bureau-developed, portable mining face shield and development by Bureau research of a new methane-detecting device, small enough to be carried in a man's pocket and operated by one standard flashlight cell. At the same time, cooperative research by the Bureau and industry moved closer to obtaining a practical design for a continuous methane-

monitoring system with automatic power shutoff for electrical equipment operated in face areas of coal mines.

Production of safety-education films for mineral-industry workers was intensified during the year, and approximately 10,000 persons completed the Bureau's various accident-prevention courses. The Bureau's 246 coal-mine inspectors made nearly 12,000 routine and special inspections of the Nation's coal mines.

Helium.—Construction of a fifth Bureau of Mines helium plant at Keyes, Okla., designed to add 290 million cubic feet a year to the Government's helium-production capacity, was nearly completed as the fiscal year closed. The Bureau's Navajo helium plant, Shiprock, N. Mex. was shut down temporarily because of reduced supply of helium-bearing natural gas. However, a new source of helium was arranged and the plant was readied for return to production.

Refinements were made in the Department's proposed helium-conservation program that would encourage private industry to build up to 12 plants to recover helium now being lost when it goes to fuel markets as a constituent of natural gas. Toward the end of the year, the Department renewed its request to Congress for enabling legislation that would establish a national helium-conservation program.

Progress in coal research.—New studies began during the year to evaluate the possibility of applying hydraulic methods in mining bituminous coal and to develop techniques for removing the explosive gas, methane, from coal beds in advance of mining. Considerable headway was made in an experiment being conducted by the Bureau and a coal company to determine whether a 30-foot vein of anthracite, pitching 25°, can be mined mechanically. The Bureau also continued its full-scale long wall-mining project to devise a highly productive mining system for anthracite beds of moderate thickness and pitch.

Coal-preparation research was concentrated on improving methods for cleaning bituminous coal, especially the fine sizes that usually do not respond well to mechanical treatment, and on experiments to develop economic methods of calcining anthracite for use as a foundry fuel. Nuclear radiation also is being utilized in research on bituminous-coal and anthracite to gain more knowledge of their fundamental properties.

Research on producing synthetic liquid fuels from coal was marked by operation of an electrically simulated nuclear reactor as part of studies to learn whether atomic heat can be used for economic production of synthesis gas.

Explosives studies advanced.—Laboratory experiments yielded further knowledge of how gas can be ignited by improperly used

explosives, and a new apparatus was designed for studying combustion reactions under high pressures.

Foreign activities.—The Bureau continued to provide industry and Government with information on mineral developments in other countries and, through a series of special studies, obtained realistic appraisals of production, trade, and mineral potential in Communist nations. Bureau specialists gave technological aid on minerals problems to 15 countries, and 25 foreign scientists and engineers received training at Bureau installations during the year.

Publications.—A noteworthy attainment in fiscal 1959 was the publication of seven volumes of the Minerals Yearbook, on which production had unavoidably fallen behind during World War II. In addition, the Bureau issued 337 other technical publications and produced some 260 articles for technical journals and scientific meetings.

The foregoing highlights only a few of the many activities of the Bureau of Mines during fiscal year 1959. Details regarding them and the Bureau's many other accomplishments during the year are found on the pages that follow.

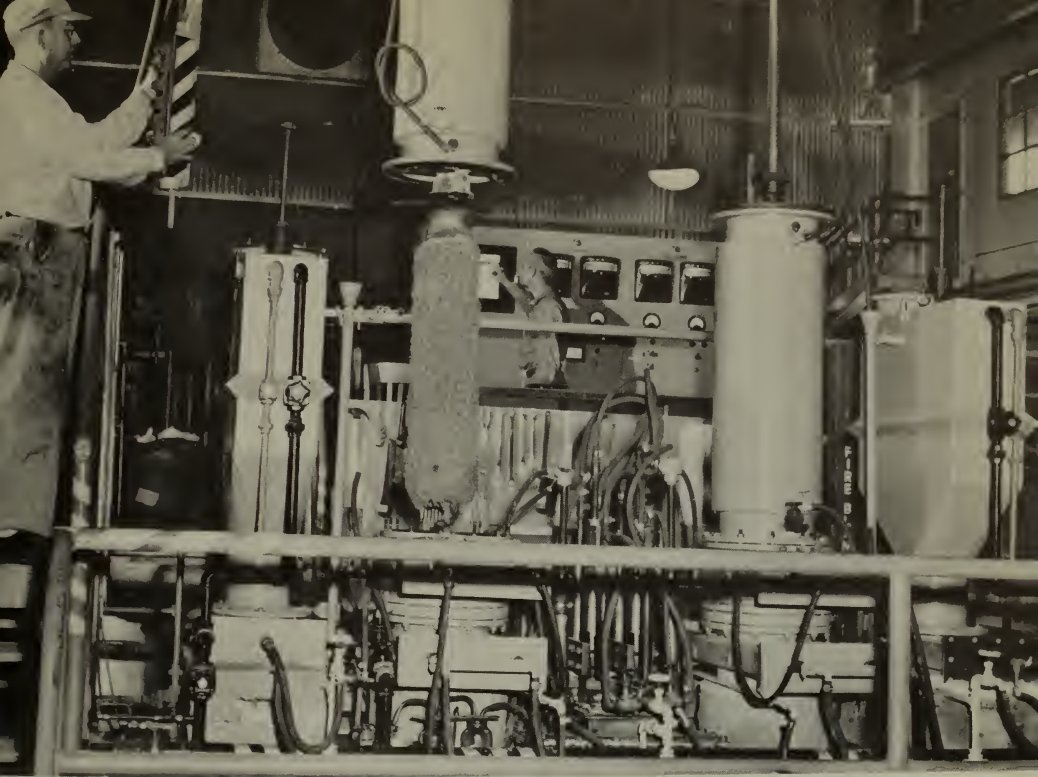
Minerals Development

Diminished demand for certain minerals and completion of new production capacity brought about an oversupply of many commodities during the year. As a result, the sense of urgency slackened in the free-world quest for assured mineral supplies, and attention shifted to developing unusual or little-known minerals, elements, and alloys. Increasing scientific knowledge revealed new vistas in man's endless search for ways to advance his material well-being. But much work remains before scientific findings can be translated into useful practice.

Despite the abundant mineral supply, competition from other nations, now recovered from the impact of World War II, compelled American industry to strive for greater technologic efficiency to maintain its position in world markets.

During the 1959 fiscal year, the Bureau of Mines continued to give high priority to defense activities, providing essential information for the Department of the Interior's Office of Minerals Exploration. The Bureau staff also advised the General Services Administration on many matters concerning national defense.

Bureau scientists served on many committees and boards, including those of the American Society for Testing Materials; the American Institute of Mining, Metallurgical, and Petroleum Engineers; the National Academy of Sciences; the American Chemical Society; and the American Standards Association.



A deposit of electrorefined titanium emerges from a cell at the Bureau's Boulder City, Nev., Metallurgy Research Center.

Construction began during the year on the Bureau's new research center at Fort Snelling, Minn.

Base Metals

Field examinations of copper antimony, mercury, and tin deposits in Alaska and Washington progressed favorably, and reports were issued describing lode and placer tin deposits in Alaska. A Bureau study of mercury resources in the United States was nearly completed, and plans were formulated for publishing its findings. Method and cost studies at base-metal mines in Alaska, Arizona, Missouri, Montana, Nevada, New Mexico, Utah, and Washington were described in reports issued during the year and a Materials Survey on cadmium was published.

Progress was made in applied-physics research at open pit and underground copper mines; one such study in Michigan contributed to the development of a mining method that will nearly double the percentage of ore extraction.

A Bureau study on noise abatement developed fundamental data for establishing methods of reducing and controlling noise in mining.

Another investigation disclosed that the use of precast concrete supports for mine openings shows great promise for solving ground-support problems in deep mines.

Significant gains were attained in metallurgy. The Bureau began an evaluation on a semicommercial scale, of its segregation process for treating oxide and mixed oxide-sulfide ores of copper. Basic research on copper reverberatory-furnace slags yielded a method for recovering copper from furnace dust trapped in the precipitator.

Studies on recovering antimony and mercury from Alaskan cinnabarstibnite ore by flotation and FluoSolids roasting were completed, and the results published, and research progressed on leaching mercury ore and concentrate and recovering finely divided lead and zinc sulfide minerals.

Research on secondary nonferrous metals advanced in refining cadmium and iron-contaminated zinc; recovering tin from hardhead and lead from battery plates; and vapor pressure, selective oxidation, and distillation studies.

Under Bureau fellowships at the University of Arizona, research was completed on specific phases of leaching copper, lead, and zinc minerals at elevated temperatures and pressures and on an experimental study of ore transport with scrapers.

Ceramic and Fertilizer Materials

Bureau research on superrefractories was intensified during the year. The number of scientists engaged in this program was more than doubled, and new techniques were acquired for measuring properties of refractory oxides at high temperatures.

New equipment also was obtained including high-temperature X-ray diffraction and differential thermal analysis units for operating temperatures up to 1,500° C. and sonic equipment for detecting flaws in materials. A carbon-arc-image furnace acquired earlier was equipped with an iris diaphragm so that refractory materials can be grown under controlled temperatures. Data were collected on the thermal decomposition of cerium, lanthanum, and yttrium salts at temperatures up to 1,000° C. and on the physical properties of their derived oxides.

Underground tests with the Bureau's phosphate-rock planer disclosed a need for better cutting chisels. The second progress report on phosphate-rock mining research was published. Studies aimed at utilizing submarginal phosphate rock were continued, and an investigation was begun of cavitation and its use in breaking phosphate rock and other ores.

Bureau studies to develop substitutes for strategic natural sheet mica emphasized the determination and control of factors affecting



Operating ion-exchange columns, which are used in one of many approaches Bureau of Mines metallurgists are making to the problems encountered in separating closely associated metals.

the growth of large single crystals of synthetic mica, investigations of various compositions in the large family of synthetic fluormicas, and research on ways of converting flake synthetic mica to a commercial sheet material.

Synthetic minerals with water-swelling properties were distributed to industrial and Government laboratories for study. Ion-exchange properties and film-forming techniques were investigated for water-swelling synthetic fluormicas. The Bureau published information on the thermodynamic properties of synthetic fluorphlogopite mica and reported results of a study of hardness in synthetic and natural micas. Certain physical properties of synthetic and natural micas were determined.

Bureau research on abrasive and hard materials centered mostly on synthesizing borides of tantalum, tungsten, chromium, and zirconium investigating their properties. A method was developed for coating graphite shapes with metallic chromium.

Other studies showed that most fire clays containing quartz or pyrite in grains coarser than the accompanying clay could be upgraded to improve refractory properties.

An improved wet process was developed for extremely fine grinding of kaolin and similar materials.

Construction and Chemical Materials

Laboratory and pilot-plant research was conducted on recovering fluorine from submarginal sources. Data were accumulated on the effectiveness of defluorination methods and on methods for recovering fluorine in commercially useful compounds. Deposits of fluorspar-barite ores were examined and metallurgical research advanced toward the development of efficient means for separating and beneficiating these minerals by flotation. A report was prepared on barite resources in Arizona, and mining methods and costs were studied at two major fluorspar mines.

Elemental boron was produced in the laboratory by fused-salt electrolysis, Kroll-type reduction, and bomb reduction, and basic studies of the crystal structure of boron were continued.

Sulfur resource-and-utilization surveys were made in several Western and Midwestern States, and research on decomposing of gypsum and pyrite to recover sulfur included the construction of a special FluoSolids reactor designed to provide better processing conditions.

Synthesis of fluoramphibole and other asbestiform minerals was investigated, and information on the physical structure and other properties of asbestos was accumulated. Electron-microscope-studies threw new light on the structure of asbestos. Three asbestos de-

posits in California were surveyed, and reconnaissance diamond drilling was done at two of these deposits. A Materials Survey on asbestos was published.

Information was compiled on mining methods and costs at stone quarries and mineral-aggregates mines, on cutting and polishing stone, and on the physics of rock breakage by explosives. Strain-propagation studies by the Bureau provided background data for developing blasting procedures in open-pit mines, and high-speed photography yielded new information on quarry blasting.

Substantial progress was made in developing special instruments to aid studies of the effects of blasting vibrations on structures near quarries.

Several silica deposits sampled in the Pacific Northwest proved high enough in quality to warrant studying their potential use in relieving the industrial-silica supply problem in that area.

A survey of water supplies and requirements of the metallurgical industries provided information that will guide research on methods for removing or counteracting deleterious constituents in metallurgical processes. Research began on the effect of water impurities on flotation processes.

The Bureau cooperated with industry to improve methods for recovering spodumene from North Carolina pegmatites, the largest known domestic reserve of lithium-bearing minerals.

Ferrous Metals and Ferroalloys

Bureau research emphasized development of techniques for preparing and analyzing high-purity, high-temperature metals such as tungsten, molybdenum, and vanadium. Research on utilization of mineral resources concentrated on taconite and other low-grade iron ores and on low-grade manganese materials.

An outstanding achievement was the successful experimental use of both natural gas and coal in the Bureau's blast furnace. With both fuels metallurgical-coke requirements were reduced substantially, and pig-iron output per unit of fuel was increased. The novel way in which the gas and coal were introduced through a special set of tuyeres resulted in the added benefit of exceptionally smooth furnace operation.

Research in steelmaking demonstrated experimentally that low-nickel austenitic stainless steel can be made from offgrade ores. Sound ingots of conventional chemical composition were produced. Additional data derived by physical-chemistry research were helpful in studying steelmaking processes. Surveys began on relatively



Among the significant metallurgical attainments in the Bureau of Mines was development of the first successful technique for shape casting of molybdenum at the Bureau's Albany, Oreg., station. Here a cast tube of molybdenum is ready for finishing.

new technologic practices, including vacuum-melting methods, applications, and capacities, and the use of ultra-high-strength steels.

A Bureau-wide manganese conference established that currently used technical-and-economic evaluation studies of processes proposed for utilizing low-grade domestic manganiferous materials are a sound guide to future research. The Batesville, Ark., manganiferous-limestone deposit was reported as one of the five largest potential domestic sources of manganese.

Publications on manganese included a report on the manganese resources of Batesville; results of resources and metallurgical investigations of the Cuyuna Range manganese deposits of Minnesota; and research findings on an acid-ferrous sulfate-leaching method for treating low-grade manganese-carbonate and oxide ores.

Tungsten Research

A technique was developed for preparing 99.99-percent-purity tungsten. Research on methods for tungsten analysis was emphasized. In another important development, mechanical working of a sample of Bureau-prepared tungsten metal was demonstrated successfully. The metal was forged at 900° C. to a 75-percent reduction in thickness. Various methods for preparing high-purity metal were investigated including zone refining, electron-beam bombardment, bomb reduction, hydrogen reduction of gaseous tungsten compounds, and electrolytic refining in fused-salt baths.

Nickel-cobalt technology advanced with development of an electrolytic method for separating nickel and cobalt from mixed carbonates of these metals produced in the U.S. Government-owned plant at Nicaro, Cuba. In addition, the Bureau developed and experimented with a solvent-extraction method for producing high-purity nickel and high-purity cobalt from intermediate Nicaro products.

Successful Bureau experiments in shape-casting molybdenum attracted widespread attention from industry. This activity and that of preparing molybdenum-base alloys are part of Bureau research on high-temperature materials.

An exceptionally high size reduction of vanadium by cold-working was achieved by using small quantities of yttrium to remove impurities. Vanadium metal thus treated was cold-rolled to 0.007 inch.

Research on analytical methods led to a significant advance in identification of minute solids. The technique used a fluorescent X-ray spectrographic probe made by the Bureau to determine the elements in seams or inclusions as small as 0.01 inch.

Bureau work indicated that it is technically feasible to produce low-carbon ferrochromium from subgrade chromite concentrate in a one-stage smelting operation.

Light Metals

A preliminary examination and metallurgical testing program on the bauxite deposits of Hawaii was completed by the Bureau, and a report describing the investigation was placed in open file. No

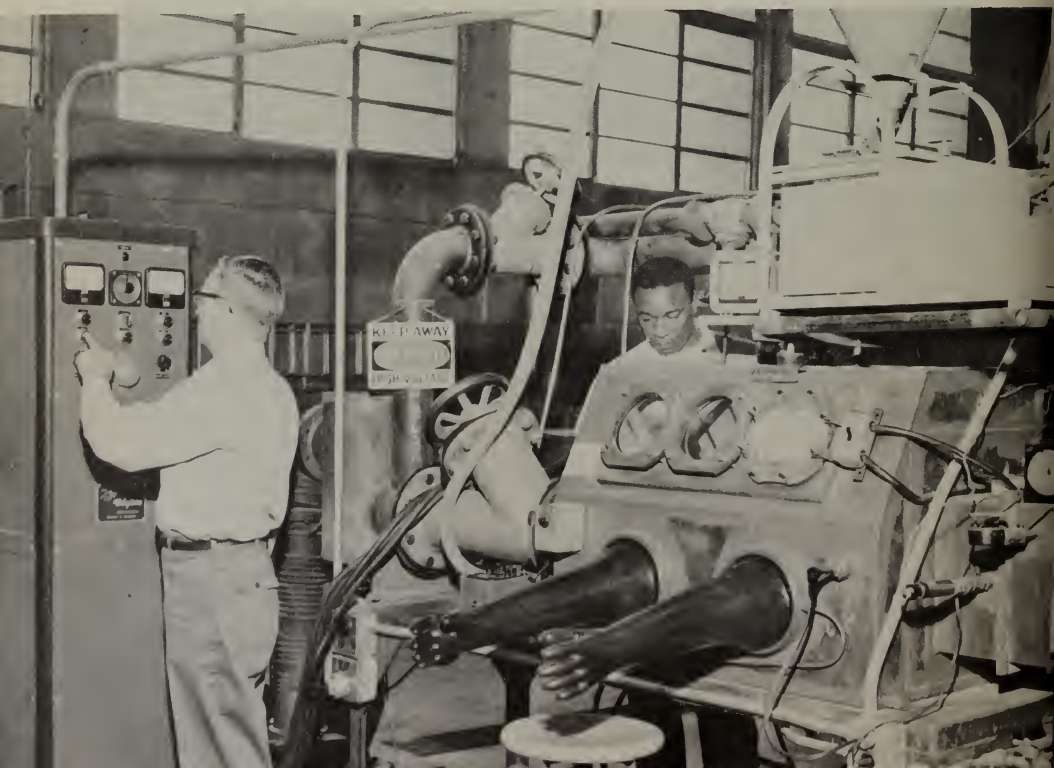
products were obtained that could be considered economically competitive with those from commercial bauxite deposits. Further investigations were planned by the Bureau and the Geological Survey of the Department of the Interior in cooperation with Hawaii. Additional samples have been collected and forwarded to the Bureau's Rolla, Mo., Metallurgy Research Center where extraction and concentration characteristics of the bauxites will be tested.

The Bureau also studied the high-iron bauxites of Oregon last year. Use of the double-leach method for extracting alumina has yielded recoveries as high as 90 percent from these materials.

New information on the binary alloys of hafnium with nickel and iron were developed by Bureau research. Laboratory tests employing sodium and magnesium mixtures for reducing hafnium tetrachlorides have shown great promise for producing cheaper hafnium metal for nuclear reactor use.

A new method was developed for separating tantalum from columbium through halogen exchanges, and chlorination techniques were perfected for extracting columbium, tantalum, and other rare metals from domestic euxenite ore. A new electron-bombardment furnace was used for making ultrapure columbium, tantalum, zirconium, hafnium, yttrium, beryllium, and other high-temperature metals.

Carefully controlled conditions surround operation of this cerium electro-winning cell at the Reno, Nev., Metallurgy Research Center.



A process suitable for commercial exploitation was developed for recovering thorium from thorite ore, and new analytical methods for cesium and rubidium were explored that will greatly facilitate future research on these two metals.

Search by the Bureau for domestic sources of beryl and its recovery has stimulated private industry to seek new sources of beryllium. A flotation process was developed on a laboratory scale that will permit recovery of beryl as a byproduct of spodumene mining at Kings Mountain, N.C., and work on a larger scale is planned. Substantial progress also was made in developing techniques for producing high-purity beryllium needed as a structural material in aircraft and space vehicles.

The Bureau developed a process and devised equipment to recover both magnesium and cadmium from a large surplus stock of demilitarized magnesium-cadmium bomb bodies held in Government storage since the close of World War II. A report was published by the Bureau on this work.

Two Bureau publications described chlorinating methods developed for treating domestic low-grade titaniferous materials.

The Bureau began operating a 10,000-ampere electrolytic cell to evaluate the commercial feasibility of its process for recovering titanium from titanium scrap and other titanium materials. The cell, a cooperative undertaking with GSA, has produced 100 pounds of high-purity titanium metal per day from a low-grade titanium metal feed.

Commercial manufacture of titanium valves is a direct outgrowth of casting studies conducted by the Bureau at Albany, Oreg. The Bureau developed a technique for casting this strong, corrosion-resistant metal, and demonstrated to industry that sound titanium valves can be made.

Rare and Precious Metals

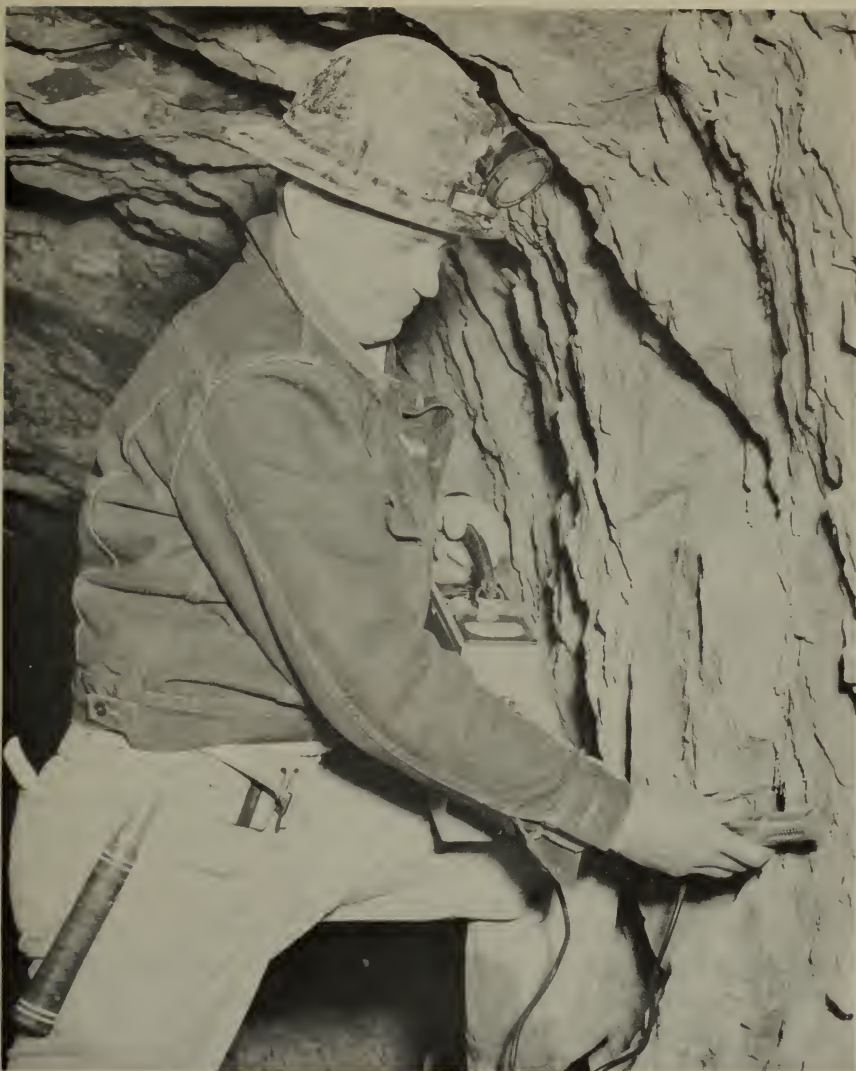
Consumable-electrode arc-melting processes developed by the Bureau for zirconium have been adopted by private industry, and are now being used in producing other high-purity metals, including high-purity hafnium, thorium, tantalum, and columbium.

Marking an important step toward utilization of the rare-earth metals, the Bureau has separated oxides of erbium, holmium, dysprosium, gadolinium, neodymium, praseodymium, and yttrium to purity in excess of 99.95 percent; work also continued on separation and purification of individual rare-earth elements. By removing gaseous impurities, yttrium metal much more ductile than ordinary commercial yttrium was produced.



Scientists at the Bureau's Albany, Oreg., research center examine a strip of high-purity yttrium metal. By finding a way to remove most impurities, the Bureau has increased yttrium's ductility, making it a potential construction material for missiles and space probes.

The Bureau began expanding research in nuclear technology, including the utilization of nuclear phenomena for research in mineral technology, the metallurgy of depleted uranium as an alloying con-



A Bureau of Mines engineer scans uranium ore with a Geiger counter.

stituent, the preparation of electrolytic uranium, and the study of radioactive-waste disposal.

Foreign Activities

Bureau interest in foreign minerals arises from the fact that markets for most minerals and progress in technology are international in scope. Mineral developments in other parts of the world, there-

fore, vitally affect domestic producers, exporters, and consumers of minerals; domestic manufacturers of mining supplies that sell abroad; and investors seeking profitable employment of capital in foreign mineral enterprises. They are no less essential to commodity and research specialists and officials coping with problems of mineral policy and supply in peace and war. To meet these needs, the Bureau's foreign activities featured the collection, analysis and interpretation, and distribution of mineral information obtained from all corners of the earth.

The Bureau relied heavily on the Department of State and the United Nations for information; during the fiscal year over 36,000 information dispatches were received from the former and nearly 20,000 from the latter.

Rapid expansion of mineral production in Communist countries and the appearance of Soviet minerals on world markets stimulated numerous inquiries to the Bureau, including several from members of Congress. Six special reports were prepared and published in Bureau and other periodicals. The paucity of statistics from Communist areas required Bureau area specialists to review voluminous scientific and technical literature in the Russian and Chinese languages to obtain realistic appraisals of Communist production and trade.

From these studies, the Bureau concluded that industrial expansion in the Soviet bloc and Communist China is supported by mineral resources adequate for any industrial output these nations are capable of organizing and managing. Continued surveillance of mineral developments in this part of the world occupies high priority in the Bureau's future plans for foreign activities.

In collaboration with the International Cooperation Administration, the Bureau maintained 13 senior technologists on technical-assistance assignments in 11 countries. These specialists were stationed in Afghanistan, Brazil, Colombia, Cuba, Indonesia, Israel, Mexico, Nepal, Pakistan, Peru, and the Philippine Islands.

Short-term assignments of seven technologists, chiefly on special detail, were completed in India, Israel, Mexico, and Panama.

Substantial services in the form of laboratory assistance and technical consultation were extended to mineral experts employed directly by ICA.

The training of foreign technical personnel at Bureau installations continued to yield favorable results. The number increased during fiscal 1959, and 25 completed their assignments in the Bureau. They represented Afghanistan, Bolivia, Chile, Colombia, Cuba, Formosa, India, Indonesia, Korea, Mexico, Peru, Philippines, Spain, Thailand, and Yugoslavia. Training in the fields of mining, metallurgy, min-



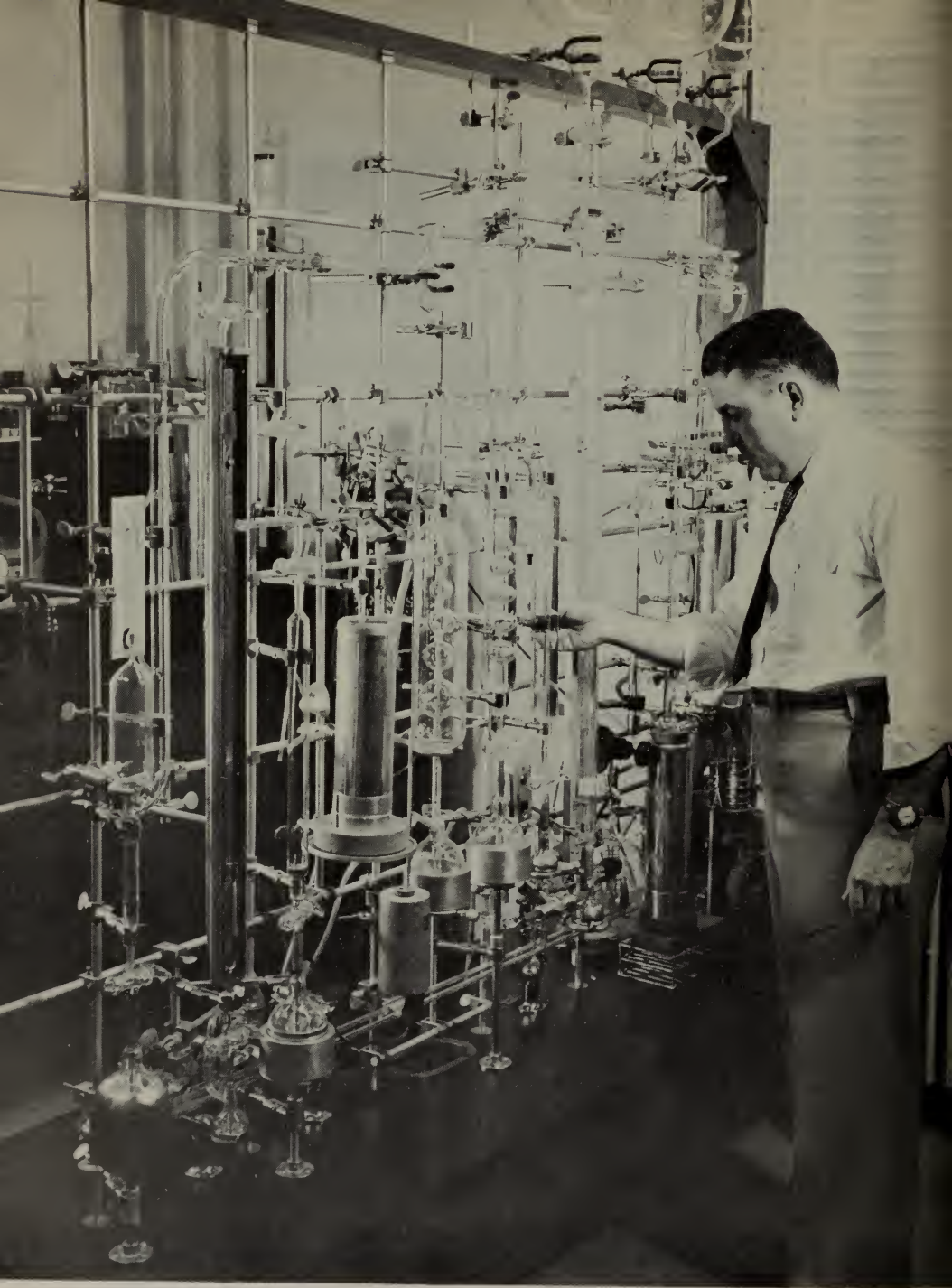
Probing the earth's interior, Bureau of Mines petroleum researchers start a gamma-ray logging device down its long journey in an oil well. Instruments in truck record findings.

eral dressing, utilization and preparation of fuels, mineral analysis, and health and safety practices was featured. At the end of the year 14 foreign visitors were in training status with the Bureau.

Petroleum and Natural Gas

The petroleum staff of the Bureau spent considerable time on a long-range report which the Office of Civil and Defense Mobilization requested from the various agencies of the Department of the Interior. This long-range study develops factual background on U.S. requirements for petroleum and estimates what they will be in 1960, 1965, and 1975. Ways to meet the requirements were studied and evaluated for national-security planning. Various phases were assigned to the Office of Oil and Gas, the Bureau of Mines, and the Geological Survey—all constituent bureaus of the Department of the Interior. Many oil companies supplied data for the study. The Bureau report was completed near the end of the fiscal year.

The Bureau of Mines and Atomic Energy Commission are co-operating to explore the feasibility of using nuclear explosives in mineral development. At a meeting with the petroleum and chemical industries to consider the use of a nuclear explosive in oil shale,



This complex array is a low-temperature gas adsorption apparatus used in connection with oil-shale studies at the Laramie Petroleum Research Center.

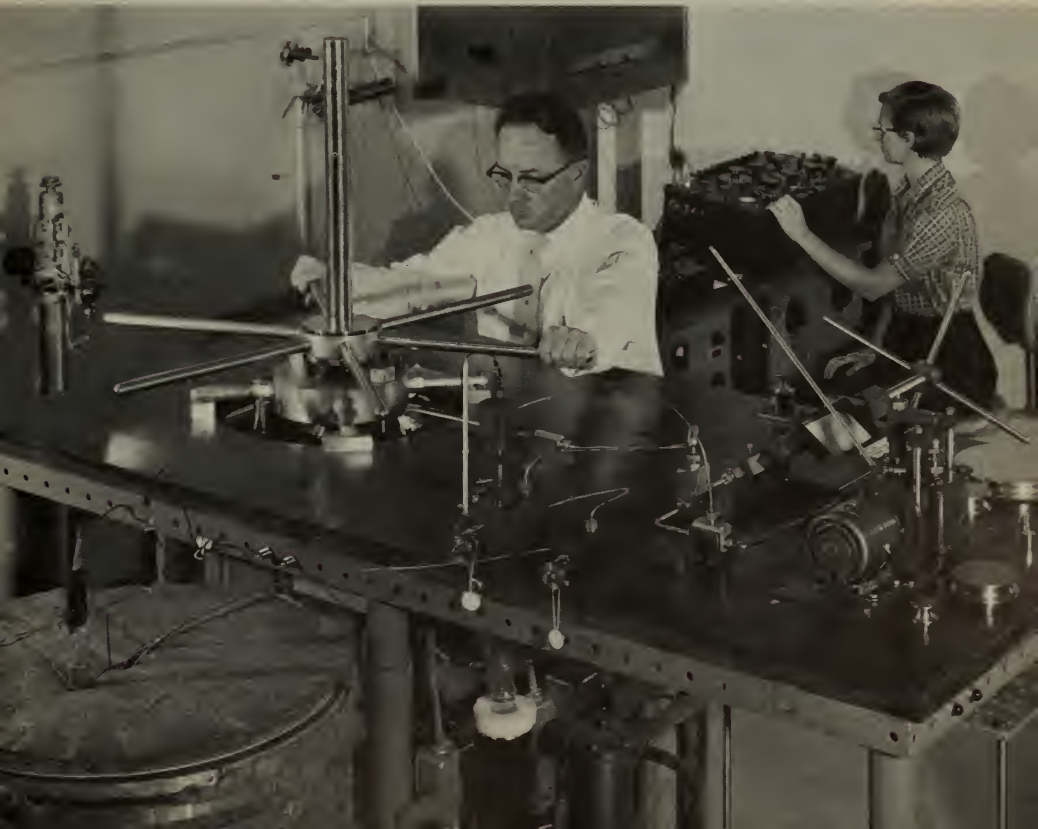
industry response to the Federal Government's proposed experiment was generally favorable, and plans were formulated to conduct a test.

Publication of volume 2 of Monograph 10 on phase relations of gas-condensate fluids completed a Bureau study of the properties of these fluids, in cooperation with the American Gas Association.

A report was completed on a rapid method for predicting performance of oil-and gas-producing reservoirs by gas drive. The theory that makes the method possible was described, and detailed directions and related numerical values were given for three specific examples of predicting reservoir performance. More accurate evaluation of the performance of any reservoir, with any combination of permeabilities and water and oil saturation, may be obtained than was possible previously. A computer program for the method was prepared.

A cooperative project in the Spraberry Field in West Texas is contemplated. Preliminary injection of "radioactive-tagged" gas

Greater accuracy in recording the characteristics of natural gas and other hydrocarbons under pressure became possible when the Bureau of Mines developed this new apparatus which employs liquid gallium metal to confine the samples studied.



in producing wells of this field, arranged to gain knowledge of the oil-bearing formation, is permitting the most economical and effective location and spacing of wells for waterflooding. The large proved reserves of the Spraberry-trend area were not highly productive until the recent application of new waterflooding techniques.

Oil recovery by in situ combustion was studied by the Bureau for possible application in the Appalachian area. Apparatus and procedure were developed to test various external sealants and to determine thermal gradients.

Knowledge of properties of compounds in crude oil that cause the oil to cling to reservoir rocks was advanced by new ultracentrifuge procedures and X-ray analytical methods. New instrumental methods were developed for determining trace constituents of oilfield brines.

Field Tests Successful

An effective and inexpensive method was tested for removing water from low-pressure gas wells with a detergent-formed foam. The method was successful in 34 or 38 field tests.

A study was begun to develop fundamental data on two-phase flow of gas-liquid mixtures in vertical tubes. The techniques of flow to be established would be applicable for reducing the cost and energy expended to lift fluids from underground formations.

A summary report was completed on an analysis of cores from a well in the Umiat field in northern Alaska. No background of experience was available for predicting the performance of this unusual reservoir, and laboratory work thus was undertaken to aid the study.

A manuscript, *Petroleum and Natural Gas Fields in Wyoming*, was completed for publication. Producing fields of the State are discussed, and analyses are presented for 418 crude oils from Wyoming fields.

Thirty-nine reports on the many phases of current oil-production research were prepared for publication.

Projects advocated for continuation and amplification include: (1) Studies of surface-activity of reservoir fluids and rocks; (2) oilfield brines and water problems; (3) behavior of hydrocarbon fluids in reservoirs, and (4) productivity of oil and gas wells—especially the rate of productivity in relation to estimated reserves. Such information would improve the accuracy of forecasts of petroleum reserves and availability.

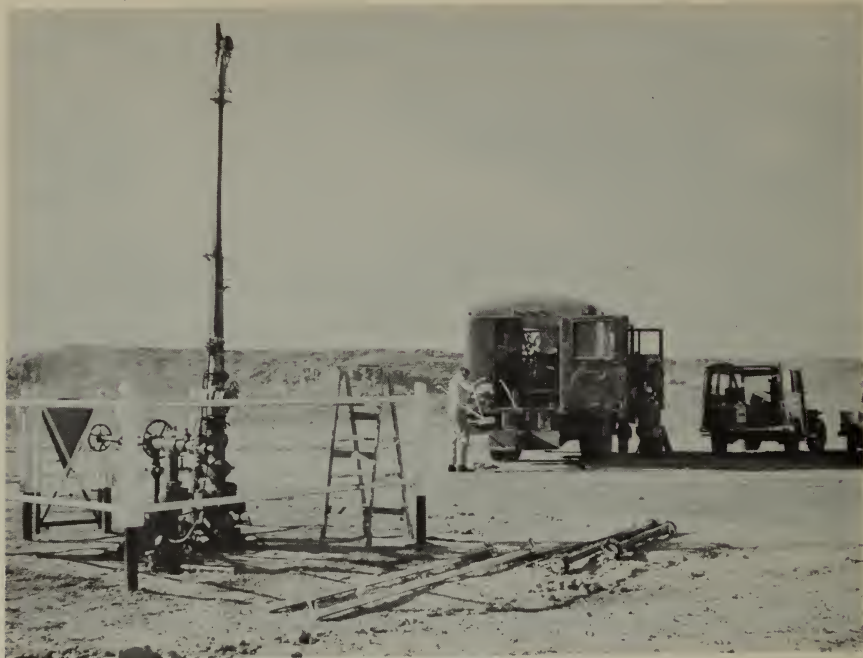
New petroleum studies being considered include: (1) Use of nuclear energy to produce oil from reservoirs that cannot be re-



A jet of foam sprays from a wellhead during field tests of a technique devised by Bureau of Mines petroleum engineers for removing water from natural-gas wells with a column of detergent-generated foam.



Field tests help Bureau of Mines petroleum engineers develop improved oil-production methods.



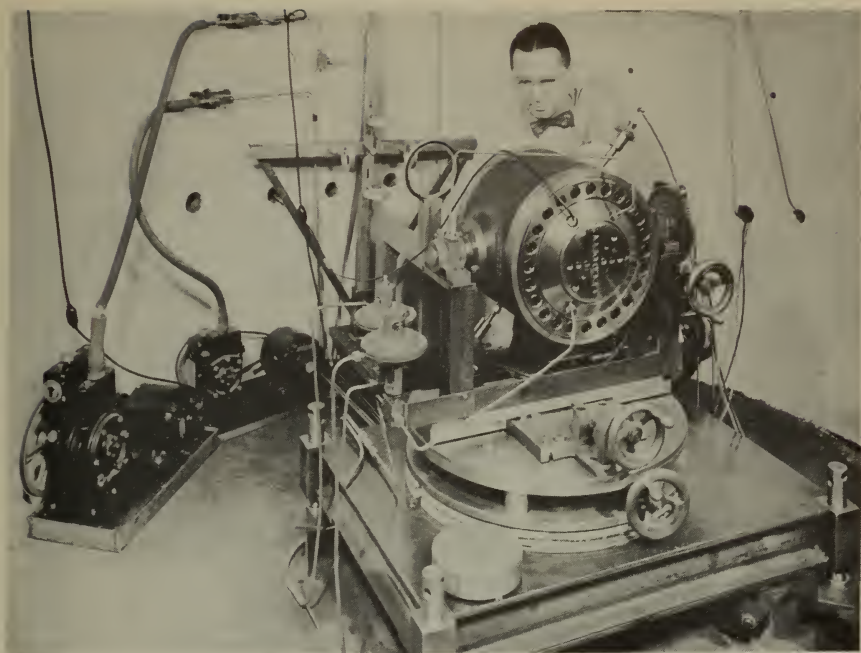
Typical mobile equipment used by the Bureau of Mines in subsurface sampling of an oil well in the Rocky Mountains area.

moved by present methods; (2) development of new gaseous tracers to follow the course of fluids underground; (3) disposal of radioactive wastes in subsurface strata; and (4) basic research in thermal methods of production (in situ combustion).

Chemistry, Thermodynamics and Refining

Identification of carbozole, (dibenzopyrrole), in Wilmington, Calif., petroleum was a major accomplishment by the Bureau. This is the first actual identification of a nonbasic nitrogen compound from petroleum. The carbazole was separated by gas chromatography and was identified by mass and infrared spectroscopic comparisons with a purified sample.

Research on missile fuels was aided greatly by the first determination of the nitrogen-flourine bond energy in organic compounds. Completing and testing a pressure-volume-temperature apparatus using gallium instead of mercury as the containing fluid was an important contribution to experimental techniques in this field. Gallium is superior to mercury for determining compressibilities of gases because it permits determinations of higher accuracy over a wider range of temperature.



Developed by Bureau researchers at Pittsburgh, Pa., this apparatus permits closeup studies of flame characteristics in exploding gas mixtures under high pressures encountered in certain military and industrial operations.

Progress was made in studies of air pollution by development of equipment and techniques for analyzing automobile-exhaust gases. This resulted in identification of 20 more compounds in a particular exhaust gas than had been possible previously.

The Bureau proposes to extend the studies to include the effect of atmospheric exposure on the composition of exhaust gases, relating the final composition back to fuel type and engine operating conditions.

Radioactive Tagging

Radioactive tagging of gasoline components was employed to solve the problem of deterioration of liquid fuels in storage and in use by determining what materials enter into formation of gum and what reactions are involved. Sixteen pure hydrocarbon compounds were tagged with tritium, a radioactive form of hydrogen. Separate blends of each compound with gasolines will be tested in storage at conditions that promote gum formation. The course of the radio-

active components, to fuel or to gum, will be determined by "counting" techniques.

Three organic sulfur compounds and two organic nitrogen compounds were purified for determination of thermodynamic properties.

Seven additional sulfur compounds were identified in Wasson, Tex., crude oil, including two homologs of thiophene. These identifications of homologs of thiophene in crude oil open an entirely new field of sulfur-compound research of immediate and potential value to petroleum refiners.

In a study of fuel availability, fuels corresponding to jet fuels JP-4, JP-5, and JP-6, rocket fuel JP-1, and a low-volatility fuel were prepared from 15 crude oils and were analyzed.

Bureau of Mines routine analyses of 226 domestic crude oils were completed.

Five petroleum-product survey reports were published, comprising two reports giving inspection data on motor gasoline and one each on aviation, diesel, and burner fuels.

In a cooperative study of stability of distillate fuels in storage, a report was made to the Bureau of Ships on separation of polar materials from test fuels and on the oxidation of pure hydrocarbons.

Detailed analysis of raw materials and products is the principal area of research the Bureau feels should receive more attention. Analysis of trace components is important. Modern engines subject petroleum products to severe conditions, increasing the harmful effects of certain trace components. The Bureau looks forward to expanded use of modern instruments and radioactive tracers. More precise and accurate analytical methods are necessary for that portion of petroleum from which jet, turbine, and diesel fuels are obtained. Preparation and purification of hydrocarbons for use as analytical and thermodynamic standards is an urgent need. The relationships of petroleum fuels and the engines in which they are used should be amplified. These areas of research reflect the need for more detailed analyses of crude oil and its products.

Petroleum and Natural Gas Economics

The growth of oil production and consumption around the world has important effects on the petroleum industry in the United States. To provide better information on these developments, the Bureau of Mines began expanding the coverage and increasing the timeliness of its monthly publication, *World Petroleum Statistics*.

The effect of foreign petroleum on the U.S. oil industry resulted in mandatory controls being placed on oil imports in March 1959.

The level of crude-oil and finished-product imports allowed under these controls is computed according to Bureau forecasts of petroleum demand.

Oil Shale Research

Bureau of Mines Fischer assays were made on 10 additional cores of oil-shale formations in Colorado and Utah and on samples of foreign oil shales collected in previous years. The data on Colorado and Utah deposits will be useful for estimating the potential oil-shale reserves of the Rocky Mountain region.

A method for concentrating the kerogen of Colorado oil shale, which includes selective wetting of the organic and inorganic constituents, yielded 7 pounds of unaltered concentrate, which will be useful in future research into the constitution of kerogen.

Nearly 1,700 X-ray diffraction and X-ray fluorescence analyses and photomicrographs were made on shale samples and related materials.

Seventeen reports on oil shale and shale oil were published or were prepared for publication.

Health and Safety Activities

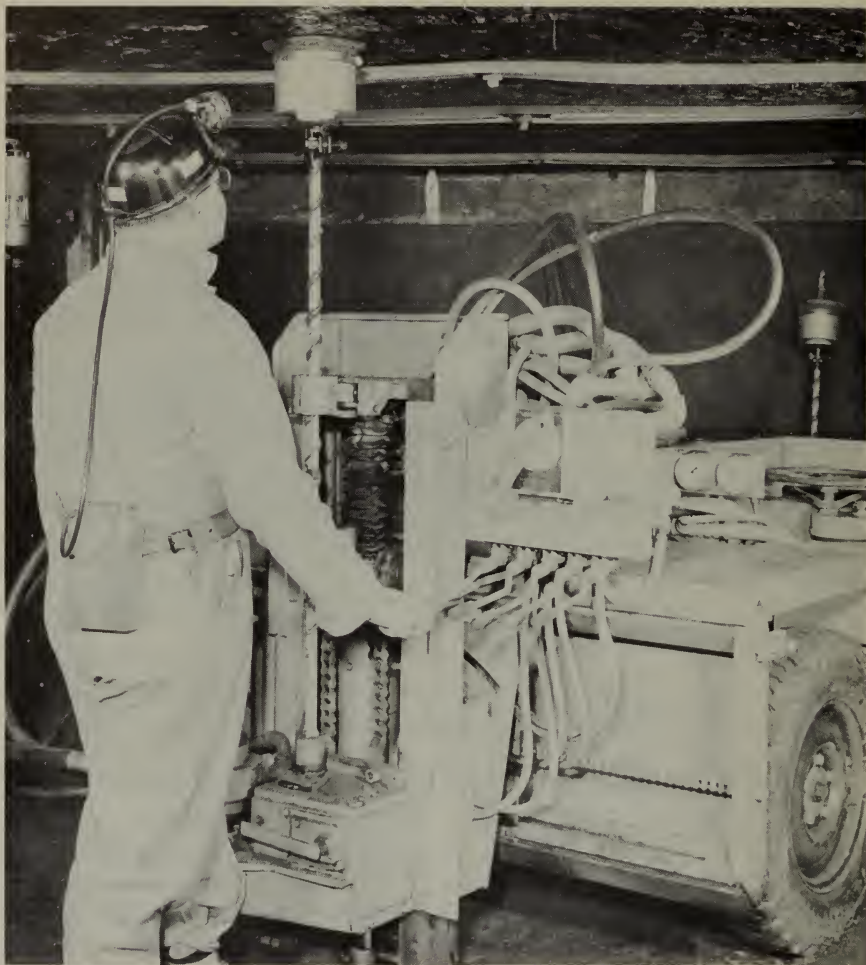
The trend in mechanization of the mineral industries continued unabated during fiscal year 1959. Advances were particularly notable in the adoption of continuous mining systems and related machines and appliances. Because of rapid changes in electric-powered machines and devices, the Bureau permitted experimental installations under appropriate regulatory safeguards.

Considerable progress was made towards solving the problem of adequate face ventilation in gassy coal mines operated by continuous mining systems.

The search for better methods of controlling mine roof continued during the year, including the application of sonic methods to predict mass movements and cementation of rock strata by injecting plastic resins into planes of weakness.

By pooling the technical resources of the Bureau and mining-equipment manufacturers, the date for producing an acceptable, safe, continuous, methane-monitoring device with automatic power shutoff for equipment used in face areas of gassy coal mines appeared closer to realization.

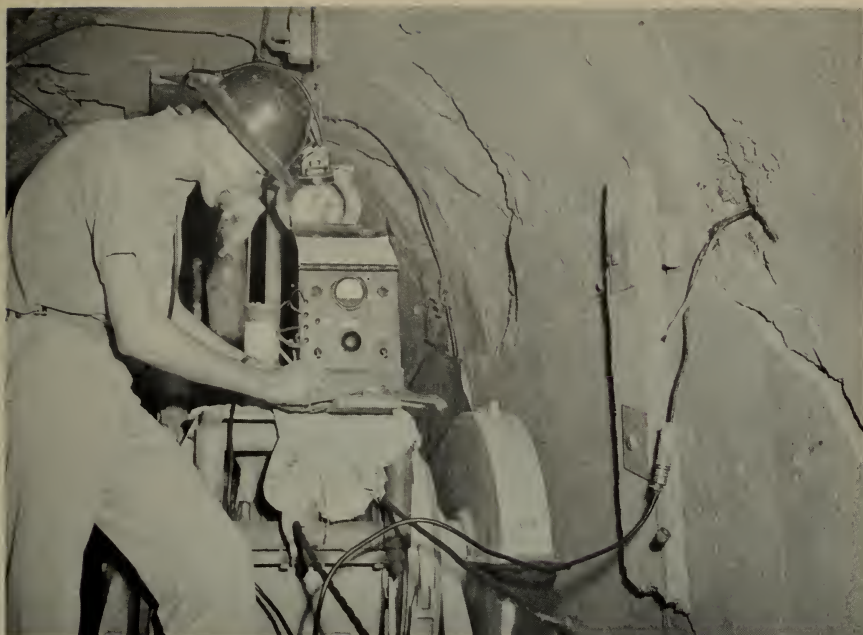
The Bureau in cooperation with the Public Health Service accelerated its studies in western metal mines to establish safe tolerances



A rotary drill with dust collector approved by the Bureau of Mines for vertical drilling.

for various atmospheric contaminants and to develop proper respiratory-protective equipment for workmen.

Studies were continued to develop safeguards against mine disasters, especially those resulting from explosions and fires. By coal-mine inspections, and safety investigations in coal and noncoal mines, and by encouraging participation in its accident-prevention educational program, the Bureau worked to promote safety throughout the mineral industries. Unfortunately, five major disasters occurred during the fiscal year—four in coal mines, killing 57 men, and one in an iron-ore mine, killing 6 men.



A Bureau of Mines researcher takes measurements of rock movements in a large underground copper mine in Arizona.

Work on Primary Hazards

Falls of roof, rib, and face caused 56 percent of the underground coal-mine fatalities in 1958 compared with 54 percent in 1957, although there were actually 41 fewer deaths from this cause in 1958. The occurrence of fatal accidents occurring within 25 feet of the working face—the most dangerous zone—dropped slightly. This indicates some progress in preventive measures.

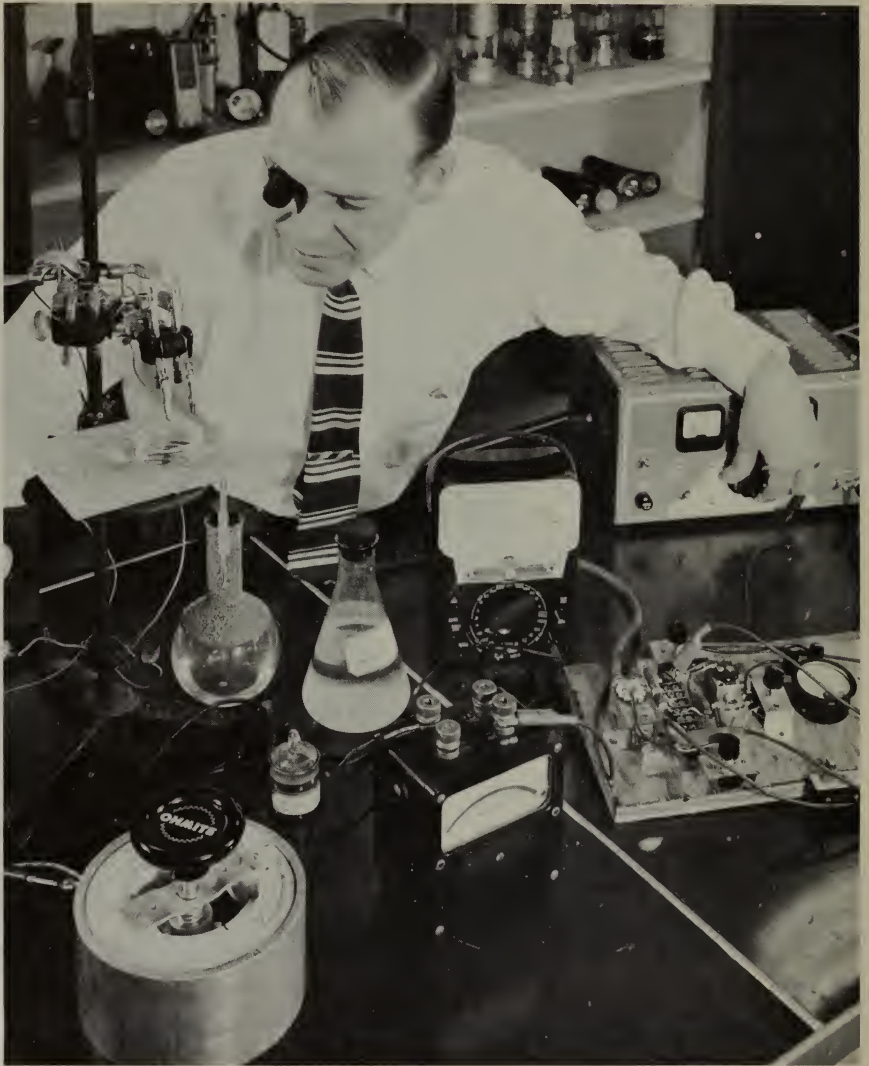
The Bureau undertook new experiments in electronics (sonar-wave projection) to determine structural conditions of mine roof. The method appears promising.

A Bureau-developed portable mining face shield was manufactured for the mining industry.

Roof-bonding experiments in coal mines continued with particular emphasis on cost reduction of bonding agents.

A uniform method for testing the effectiveness of roof-bolt anchorage was being established.

Cooperative research to develop a continuous methane-monitoring system with automatic power shutoff for electric-powered equipment operated in face areas of gassy coal mines moved steadily ahead during the year. Under Bureau leadership, one company built a



A Bureau of Mines scientist operates an experimental setup at the Central Experiment Station as one step in seeking a continuous methane-monitoring device to warn of gas in coal mines.

continuous methane-monitoring device which is activated by a power-cutoff device developed by another company.

Bureau research to develop longer-lived electric filaments—the heart of most methane detectors—produced a new methane-detecting device, small enough to be carried in a man's shirt pocket, and operated by one standard flashlight cell. Research continued at the Bureau's Experimental Coal Mine, seeking a solution to the problem

of face ventilation where continuous-mining machines are used. Field data were collected in operating coal mines in Pennsylvania and West Virginia to supplement experimental results.

Problems in operating multiple main fans for ventilating bituminous-coal mines were investigated. Fan characteristics were studied and evaluated and recommendations prepared and disseminated to the industry through Bureau publications.

Testing Equipment

As mechanization of coal mines continued to increase, the Bureau's workload of testing mining equipment for permissibility increased correspondingly.

During the year 114 new approvals were issued for electric- or diesel-powered equipment under 12 testing schedules. Approvals included 3 conventional mining machines, 20 continuous miners, 9 conventional loading machines, 19 shuttle cars, 2 rock-dusting machines, 15 conveyors, 13 drills and drilling machines, 6 distribution boxes, 1 dry-cell handlamp, 3 cap blasting units, 2 air compressors, 1 cleanup machine, 3 roof bolters, and 1 hydraulic-power unit. In

Surface subsidence created by block-caving methods employed at an underground copper mine is measured by a Bureau of Mines engineer.



addition, 1 diesel shovel, 2 diesel trucks, and 1 diesel locomotive were tested and approved for underground use in noncoal mines.

The Bureau also issued 115 extensions of approval, explosion-tested 78 compartments, conducted 2,716 explosion tests in natural gas-air mixtures, and flame-tested 72 cables. Forty-six conveyor belts were accepted for listing as flame resistant.

Nine new approvals were issued for drill-dust collectors for coal mines, and eight extensions were granted.

The Bureau's permissibility for multiple-shot blasting units was revised to permit approval of units that fire up to 20 short-delay detonators instead of 10 as previously approved. The schedule covering lighting equipment for underground workings also was revised during the year.

Five new approvals were issued for respiratory-protective equipment, and 88 extensions were granted.

The Bureau's schedule covering nonemergency (chemical-cartridge) gas respirators was revised to include paintspray respirators and published tentatively in the Federal Register.

Health

The Bureau's program to promote healthful working conditions in the mineral industries was carried forward through work on gases, dusts, and respiratory protection.

Approximately 19,000 gas samples were analyzed during the year, most of which were collected by Federal coal-mine inspectors. Samples analyzed were from sealed fire areas in coal mines, coal-outcrop fires, metal and salt mines, tunnels under construction, tests of diesel-powered equipment, tests of respiratory-protective equipment, and miscellaneous field studies and laboratory investigations.

Field studies were conducted on toxic gases produced by blasting with ammonium nitrate-fuel oil mixtures.

The Bureau's survey of working environments in western metal mines, begun in 1958, was intensified during the year. More than 900 samples of dust and dust-source materials were examined by microprojection, X-ray diffraction, emission spectrometry, or chemical methods to determine dust concentration, particle-size distribution, or chemical composition for evaluating the presence of harmful radioactive and siliceous constituents. Dust production and dust-control methods were studied in four coal mines.

To develop performance requirements and test procedures for evaluating respirators to protect against radioactive particles, studies were made of methods for producing aerosols of submicron size, and

the literature on aerosol filtration was reviewed and analyzed for applicability to the respiratory-protection problem.

Operating characteristics of self-contained oxygen-breathing apparatus were studied to determine whether such equipment may be worn safely in air pressures exceeding ordinary atmospheric, such as those in underwater tunneling or caisson work under compressed air.

Safety Education

Stepped-up production of safety-education films for use in safety training classes and introduction of a new course in fundamentals of coal-mine accident prevention keynoted the Bureau's progress in promoting safety training during the year. Bureau safety films were viewed by approximately 102,000 mineral-industry workers.

Approximately 10,000 persons completed the Bureau's various accident-prevention courses, bringing the total of those trained since 1931 to 234,000, of whom 218,000 completed the coal-mine accident-prevention courses.

Emphasis continued on 100-percent participation, as Bureau records show the greatest improvement in safety is made at mines and plants where every official and workman has received training.

Approximately 34,700 persons completed first-aid and mine rescue training during the year. Since 1910 nearly 2 million workers have completed the Bureau's first-aid course, and 118,000 have taken its mine rescue courses. The Bureau sponsored and furnished officials and judges for local, State, and national first-aid and mine rescue contests and sponsored the Holmes Safety Association, a national organization dedicated to the prevention of coal-mine injuries.

Bureau representatives investigated dust explosions in industrial plants and provided leadership and assistance in preparing national codes and standards to prevent such disasters.

Accident Analysis

Analysis of injury and related employment data continued to provide a guide for developing better programs to prevent accidents in the mineral industries.

Annual canvasses were conducted to obtain injury and employment information in the mineral industries, including coal mining, coke manufacturing, peat mining, quarrying, metal mining, non-metallic-mineral mining, sand and gravel operations, slag plants, metallurgical plants, and petroleum and natural-gas production and

refining. The Bureau publishes severity as well as frequency rates for coal mining, metal mining, nonmetallic-mineral mining, and the petroleum and natural gas industries.

Approximately 1,000 mines, quarries, and plants participated in the 34th National Safety Competition sponsored by the Bureau. Certificates of Accomplishment in Safety were presented to approximately 2,000 workmen and supervisors at winning plants.

Control of Fires in Inactive Coal Deposits

Under Bureau guidance, 68 of the 190 known fires in inactive coal deposits had been extinguished or controlled by the end of the year; 38 were on the public domain and 30 on private property. An estimated 298 million tons of coal has been conserved under this program since fiscal year 1949 when funds for this purpose were first appropriated.

During the year, seven fire-control projects were completed—four on public lands and three on private property. Work was in progress or being scheduled for nine other fires—four on the public domain and five on private property.

New projects will be started in order of urgency and as appropriations permit. Necessary maintenance work is done on completed projects so that the fires will not break out again. The Government pays the full cost of controlling fires on Federal land but not more than half the cost if the fires are on private property.

Coal-Mine Inspection

Fiscal 1959 saw completion of the seventh full year of Bureau activities under the Federal Coal Mine Safety Act.

The act consists of Title I, authorizing the Bureau to enter and inspect coal mines, report on hazards, and recommend their correction; and Title II, embracing specific enforcement provisions designed to prevent explosions, fires, inundations, and man-trip and man-hoist accidents in mines regularly employing 15 men or more underground.

More than 10,700 coal mines operated throughout the Nation during the year, including 1,338 Title II mines, 7,511 Title I underground mines, and 199 auger mines and 1,664 strip mines—also classed as Title I mines. At the end of the year, Bureau personnel assigned to coal-mine inspection and related duties included 246 coal-mine inspectors, 11 engineers, and 11 coal-mine electrical inspectors.

During the year these employes made 2,972 routine inspections of Title II coal mines; 35 of these inspections were made jointly with State inspectors under State-Bureau cooperative agreements as provided in the Act. In addition, 935 special inspections were made to determine whether previously cited violations of mandatory provisions had been abated.

Federal inspectors noted 7,167 violations of the mandatory safety provisions, many of which were corrected immediately and thus required no formal action.

They issued 1,105 notices allowing a reasonable time for abating dangers, 169 time extensions, and 1,050 certifications that the cited dangers had been totally abated.

During the year 98 orders were issued requiring withdrawal of men from all or part of 70 mines—60 orders at 51 mines because of imminent danger and 38 orders at 19 mines because of failure to abate violations within a reasonable time. By comparison, 82 withdrawal orders were issued at 57 mines in fiscal year 1958.

Orders were issued classing 10 mines as gassy, which previously were classed as nongassy. In fiscal year 1959, no appeals were made to the Federal Coal Mine Safety Board of Review—an independent, quasi-judicial tribunal—but the U.S. Court of Appeals for the Third Circuit affirmed the Board's denial of an application for annulment of a gassy-classification order in response to an appeal by a coal-mine operator filed in fiscal year 1958.

Federal inspectors and engineers also made 8,015 routine inspections of Title I mines (including 1,160 at strip mines and 188 at auger mines); 731 electrical, ventilation, dust, blasting, and related surveys; and 507 investigations of fatal and serious nonfatal accidents, mine fires, gas and dust ignitions, and miscellaneous conditions.

Four major disasters (single accidents causing five deaths or more) occurred during the fiscal year—three were mine explosions and one resulted from a sudden inrush of water into a mine from a surface stream.

Preliminary reports show 356 coal-mine fatalities in calendar year 1958, compared with 477 in 1957. The fatality-frequency rate per million man-hours of exposure decreased from 1.17 to 1.12 in 1958. The fatality-frequency rate for the first 5 months of 1959 was 0.91.

Helium

Assurance that helium would be available for the Nation's future growth came one step closer to realization in fiscal year 1959. In August 1958 a proposed amendment to the Helium Act of 1937, as

amended, was sent to Congress. The proposal reached Congress too late in the second session to be considered; consequently, it has been re-submitted to the 86th Congress. If enacted, the legislation will make possible the conservation of helium now going to fuel markets as a noncombustible component of some natural gases from the southwestern part of the United States.

To accomplish the conservation, up to 12 new helium plants are advocated. Private industry would be encouraged to finance, construct, and operate these plants under the proposed legislation. They would be located on interstate pipelines carrying natural gas with a helium content above 0.4 percent, to recover helium that otherwise would be lost to the atmosphere when the gas is burned for fuel.

These plants, in addition to four Bureau of Mines plants now operating and one now in construction near Keyes, Okla., could recover about 43.5 billion cubic feet of helium in the next 15 years. Total demand during that period is estimated at 11.5 billion cubic feet, leaving approximately 32 billion cubic feet for conservation in underground Federally owned storage.

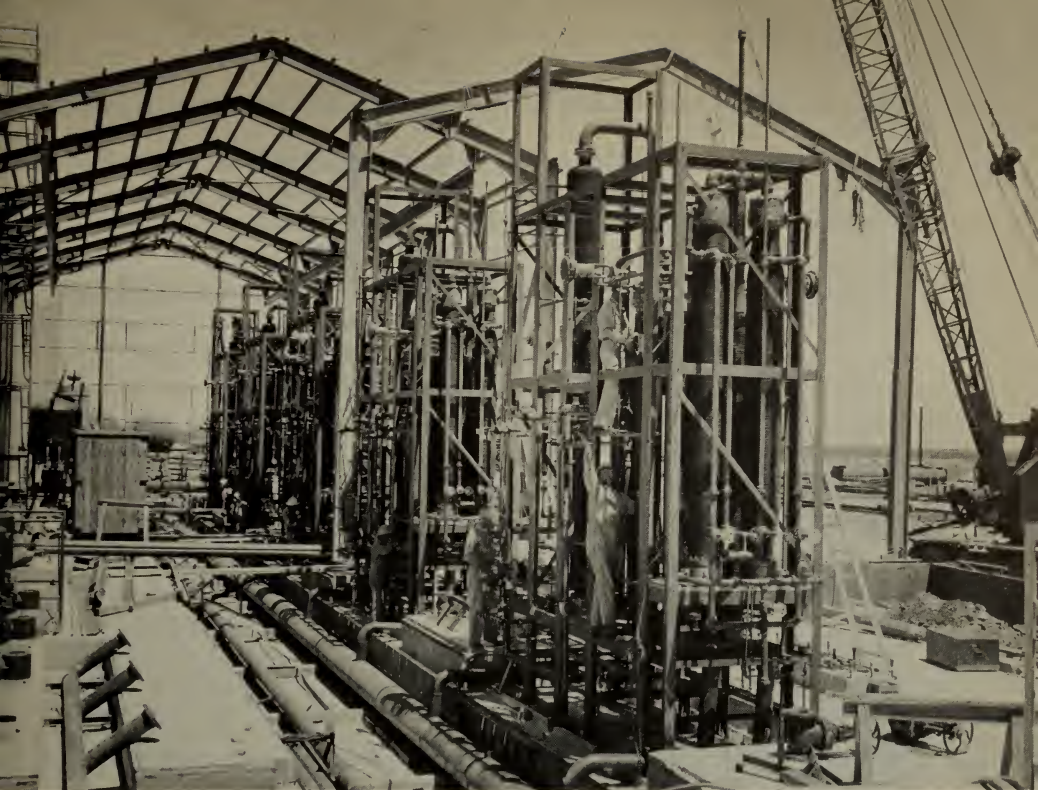
So that the current basic needs of the Federal agencies and commercial, medical, and scientific users can be met, Congress made funds available to construct a new helium plant in the Keyes gas-field of Cimarron County, Okla. Natural gas from this field contains about 2 percent helium, and the deposit is ample to supply the plant for many years.

Plant Nears Completion

The contract for engineering, design, and construction of the Keyes plant was awarded to the Fluor Corp., Los Angeles, Calif., in November 1958. Good progress has been made in all phases of the work, and the plant will be in operation in August 1959. It is designed to produce 290 million cubic feet of helium a year.

The Bureau of Mines operated four helium plants in fiscal year 1959. The Amarillo and Exell, Tex., and Otis, Kans., plants were in production throughout the year. The Navajo plant at Shiprock, N. Mex., had to be shut down in August 1958 and put on a standby basis because of an insufficient supply of helium-bearing natural gas; however, the Pan American Petroleum Co., completed a gas well in June 1959 about 8 miles from the Navajo plant. The gas averages 5.8 percent helium. A gas-supply contract was negotiated with Pan American, and the plant is being reactivated.

Notwithstanding the loss of production from the Navajo plant, both production and shipments of helium reached new highs in fiscal year 1959. Output totaled 354 million cubic feet. In addition, with-



Installing helium-purification units during construction of the new Bureau of Mines helium plant at Keyes, Okla. These five units, built at the Bureau's Amarillo, Tex., installation, have a combined capacity to process more than $1\frac{1}{4}$ million cubic feet of helium a day.

drawal of helium from underground storage in the Government-owned Cliffside gasfield near Amarillo, Tex., made possible shipments of 360 million cubic feet.

Even though production and shipments of helium were at record rates, there was not enough to satisfy the needs of all users. With the Federal agencies holding their requirements to a minimum, it was possible, through an informal allocation system, to make helium available for medical purposes, defense contract work, and most scientific and research programs.

Many Uses of Helium

The helium was used by the Air Force and Navy in rockets and missiles programs, by the National Aeronautics and Space Administration for wind-tunnel and shock-tube tests, by the Atomic Energy Commission in nuclear fuel reactor development, by the Weather Bureau to inflate meteorological balloons, by the National Institute of Health in medical research, and for many other purposes by these

and other agencies. Commercial users employed helium in shielded-arc welding, leak detection, gas chromatography, low-temperature research, inert atmospheres required in growing silicon and germanium crystals, and in medical and scientific research.

Nearly 80 percent of the helium shipped went to Federal agencies, and an estimated 75 percent of the helium delivered for commercial requirements was used on defense and atomic energy contract work.

Consequently, almost 95 percent of the helium shipped was utilized directly or indirectly to benefit the Federal Government. Most of the remaining 5 percent was used for medical purposes, by colleges and universities, and in private industry-supported research.

The Bureau's survey of new discoveries of natural gas in the United States was continued to determine sources of helium-bearing natural gas; however, no sources comparable to those already found were disclosed. The properties and characteristics of helium-bearing natural gas and helium-gas mixtures were studied to improve production, purification, and transportation methods and to reduce their cost. Much of this research will be useful in designing and building the helium plants proposed under the new conservation program. An open file of information developed from research and relating to the extraction of helium from natural gas by low-temperature processes was made available in May to those interested in the conservation program.

A 500-pound mixture of coal is shoved into the Bureau's experimental coke oven in Denver, Colo., Coal-Research Laboratory.



Bituminous Coal Activities

Bituminous coal's share of the Nation's total energy market has declined steadily in recent years. To reverse this trend and to insure continued availability of a resource that will become increasingly important as energy needs expand requires intensive research in all phases of coal operations, from extraction to utilization.

Technological Research

The Bureau's research on bituminous coal is oriented toward developing new or improved techniques to assure wise utilization. During fiscal year 1959, studies to evaluate the coal reserves of Alaska were continued by the Bureau and a preliminary reconnaissance was made of the Beluga River coal area.

In other realms of research, a field site was selected and high-pressure equipment was assembled for mining coal hydraulically. Plans were laid for studies of methods for degasifying coal beds—eliminating explosive methane—in advance of underground mining.

A large percentage of the bituminous coal mined is processed to meet market requirements before shipping, and Bureau research is directed toward improving methods for cleaning coal, especially the fine sizes that usually are least responsive to mechanical treatment. Tests of the stationary-type DSM screen used in Europe demonstrated that it can size effectively very fine material with exceptionally high capacity. As a dewatering device, however, it is inferior to conventional vibrators. The efficiency and operating characteristics of mixers, i.e. the extent of mixing of certain types of solids as a function of number of revolutions and equipment design, also were studied. The cyclone washer, used widely in European coal preparation practice to treat a deslimed feed, is being tested to determine its efficiency in cleaning an unsized feed.

Problems in lignite preparation and handling are also being studied. Research to develop means for overcoming the tendency of lignite to freeze during winter transit showed that the addition of air-dried lignite to the as-mined product is especially effective in preventing serious freezing.

Studies of the preparation and carbonizing characteristics of American coals continued; reports on coals from counties in Alabama, Kentucky, Pennsylvania, Virginia, and West Virginia, were published during the year.

New Irradiation Studies

Extending research on coal's structure and properties, the Bureau undertook new studies to determine the effects of irradiation on coal.

Examination of coal-analysis procedures also continued. A method for determining sulfur in coal ash was presented to ASTM for consideration as a standard, and two analytical techniques commonly used abroad were evaluated.

In research to improve combustion and furnace efficiency, the performance of large power boilers was investigated as a step toward more effective boiler design and operation.

Related studies sought ways of preventing corrosion in return-line condensates and deposition in boilers.

A large coal-fired gas turbine was loaned to the Bureau by the Locomotive Development Committee of Bituminous Coal Research, Inc. for tests through which the Bureau hopes to develop a coal-burning gas turbine capable of fulfilling the long-life requirements of stationary plants. The Bureau will work toward improved turbine blade design and improved materials of construction that will permit longer turbine blade life.

Research progressed on the use of ultrafine coal as a fuel for coal-burning gas turbines.

Studies continued on the mechanism and kinetics of coal carbonization, and coke-improvement studies were made of various coal blends. Attention was also directed toward differences in the properties of cokes prepared in experimental- and commercial-ovens in an attempt to explain and eliminate the factors responsible for these variations.

Knowledge gained in research on separating and characterizing low-temperature coal-tar products should provide a good basis for evaluating processes that will permit commercial upgrading and utilization of these tars.

Cooperation With AEC

Operating an electrically-heated simulated nuclear reactor, the Bureau continued to cooperate with the Atomic Energy Commission in studies to determine whether nuclear heat can make possible economic production from coal of synthesis gas—a source of high-B.t.u. gas or liquid fuels. Major emphasis is on developing suitable construction materials for the reactor and on determining mechanical and process components.

Gasification of lignite with steam and oxygen in a fixed-bed pilot plant, under slagging conditions, was investigated.

Experiments in gasifying coal underground indicated that gas obtained by this method cannot be produced and used economically in the United States under present technology.

In research on direct hydrogenation of coal, the Bureau investigated the possibility of simplifying this process and reducing its cost by reacting coal with sodium hydroxide. Hydrogenation of coal at high temperatures to produce methane also was investigated in a cooperative study, which indicated that 90 percent or more of the coal can be converted and the distribution of gaseous- and liquid-fuel products controlled within fairly wide limits.

Research on producing liquid fuels from coal by the Fischer-Tropsch process was continued, with emphasis on preparation and testing of catalysts and other studies directed toward improving the economics of the F-T synthesis.

Bituminous Coal Economics and Statistics

Although production of bituminous coal and lignite declined almost 4 percent during fiscal year 1959, there was a pronounced upturn in consumption during the last quarter, with major increases at coke ovens and electric-power utilities. While the upturn lagged behind that in the Nation's general economy, this was attributable largely to substantial drops in coal exports to Europe, resulting from increases in coal stocks abroad, import restrictions on United States coal, and increased competition from other energy sources.

Besides publishing information on international coal trade, the Bureau assisted other Departments in connection with coal activities abroad, and prepared a report on the coal industry of the U.S.S.R. It also supplied detailed information for solid-fuels-mobilization planning, including data on coal-and coke-production capacities and regional availabilities of coal, coke and coal chemicals for strategic uses.

Unprecedented interest by industry, business and Government in the new bituminous coal and lignite distribution reports resulted in a decision to continue this program for another year. The economic-research program in coal production, utilization, and exports is being expanded to provide a more accurate estimate of coal's position in the changing pattern of fuel-energy consumption.

Explosives and Explosions

Intensive research continued on the use of sodium chloride in coal-mining explosives to reduce further their tendency to ignite flammable atmospheres. At the same time the ignition of fire-damp

by explosives was investigated, utilizing a statistical analysis of data from more than 3,000 experimental shots. Schedule testing of explosives, blasting devices, and similar equipment also was continued.

In response to steadily growing industrial interest in fuel-sensitized, ammonium-nitrate blasting agents, the Bureau studied the explosive sensitivity of these compositions, as well as problems associated with their use underground. Comprehensive tentative safety recommendations covering the preparation, storage, transportation, and use of these agents were provided to many users and others, with requests for comments.

Investigation of hazards associated with the large-scale production and handling of liquid hydrogen was undertaken for the Air Force, in addition to long-standing work on aircraft fuels and fluids. Work continued on reducing explosion hazards of combustible vapors in tanker holds. Flammability characteristics were determined for several industrial materials.

Experiments with hot gas jets issuing into combustible gas mixtures provided a better understanding of how gas is ignited by improperly used explosives and by flames flashing through narrow channels. In cooperation with the American Gas Association, progress was made in stabilizing flames of multiport burners and in a study of smoking flames. A new spherical vessel was developed to provide fundamental data on combustion reactions under high pressures. Photographic studies of turbulent flames continued.

In the Experimental Coal Mine, research on controlling mine fires with high expansion foams progressed; a technique employing a booster fan was developed. Investigations were completed on the hazard of fire-damp ignition by charges accidentally exposed (cut-off) during multiple blasting and by frictional sparks in mines. Laboratory studies of factors affecting the explosibility of dusts and routine tests of various commercial dusts were continued.

Air Pollution

Continuing cooperative research on air pollution with the Public Health Service, the Bureau concluded a study of incineration and furthered projects on the composition and catalytic oxidation of automobile exhausts and on removing sulfur dioxide from steam-generating-station stack gases. Industry has shown great interest in the automobile exhaust and sulfur dioxide projects, which have been discussed at technical meetings, in the technical press, and in Bureau publications.

Anthracite Activities

During the year, the Bureau's anthracite program was directed toward finding more uses for this valuable fuel, developing improved anthracite-extraction techniques and carrying out the Federal government's responsibilities under the joint Federal-Commonwealth of Pennsylvania mine-water control program.

The Bureau is cooperating with a coal company in a mechanical-mining project designed to recover a 30-foot vein, pitching 25°, using a continuous borer with auxiliary loading and conveying equipment, a new-type auger for drilling crosscuts between gangways, and steel-arch roof supports. Output averages about 600 tons of run-of-mine coal a day; however, additional loaders and conveyors recently purchased should bring it to more than 1,200 tons a day. Production for fiscal year 1959 was estimated at 100,000 tons.

Phase I of a new slope-development project was completed, with two of eight planned gangways driven from the slope.

The Bureau continued its full-scale, longwall-mining project to develop a highly productive mining system for anthracite beds of moderate thickness and pitch. A longwall face was established, and a continuous mining machine imported from Germany was given limited tests. Major problems encountered were dust control and overhanging top coal. Equipment used on American continuous mining machines will be used to control dust, whereas water-infusion methods are being studied for taking down top coal.

Research on the vertical hydraulic transportation of large-size solids in pipelines continued during the year, employing a 6-inch pyrex-glass pipeline, 60 feet long, to determine specific gravity and settling velocities for various sizes and shapes of anthracite, slate, and rock. A variable-speed pump will be used to pump solids through this same line to observe their behavior at different speeds.

The pilot calciner was operated 6 months to produce calcined anthracite for foundry experiments. Tests in a merchant foundry indicated that fairly satisfactory melting could be obtained with calcined anthracite, but metal temperatures were not as high as those obtained with premium foundry coke. Though calcining seems to lessen thermal decrepitation the small size of the calcined fuel apparently limits its adaptability. The metallurgical-briquet pilot plant was completed and used to prepare nearly 100 tons of briquets for calcining. Equipment was designed and preparations made for studying the kinetics and thermodynamics of the anthracite-hydrogen reaction. Fundamental studies of the nitric-acid oxidation of

anthracite showed that at least seven reaction products are present in the acid-soluble portion.

Neutron-and gamma-radiation tests on samples of low-, medium-, and high-volatile anthracite indicated that radiation increased the apparent hardness of each. Moreover, the number of free radicals increased markedly in the high- and medium-volatile samples. The effect of gamma radiation on the reactions of anthracite with selected chemicals will be investigated in the coming year.

Data obtained in studying the performance of small industrial stokers will be released in conjunction with a publication of the ASTM Code Tests.

Research on New Processes

Preparation research was concentrated on devising new processes and improving present ones for cleaning and sizing anthracite. The heavy-medium pilot plant was equipped with a radioactive detector to insure more precise control. A study of washability characteristics of Holmes and Mammoth seam anthracites was completed. Pulverizing tests showed that fine anthracite (100 percent minus 10 microns) can be prepared in an airswept ball mill.

Under the Federal-State Anthracite Mine-Water Control Program, eight projects were approved by the Secretary of the Interior during the fiscal year. The projects will cost an estimated \$4,400,000 of Federal and State funds.

Five projects costing \$2,107,000 were completed. At year's end, four projects were under construction, and purchase contracts had been awarded on four others.

At the close of the year, 24 projects had been approved by the Secretary; 3 had been withdrawn because of changed conditions; the 21 remaining represent a total expenditure of \$7,700,000.

During the year, Bureau reports issued periodically on estimated production, distribution, stocks, wholesale mine prices, hours and earnings, and other relevant data provided reliable information to industry and the public.

River Basin Activities

Continuing to promote the conservation and development of water resources so essential to mineral production, the Bureau of Mines helped many Federal, State, and private agencies solve problems of water and power supply, mine drainage, pollution, and inundation of mineral resources.

Professional mineral-engineering consulting services were supplied to the Federal Power Commission, the U.S. Army Corps of Engineers, the Departments of Agriculture and Justice; and the Bureaus of Land Management and Reclamation and the National Park Service of the Department of the Interior regarding many mineral problems involved in water and land withdrawals. Where the Nation is faced with the loss of mineral deposits by inundation, ways were sought to preserve access to such deposits while permitting construction of water-development projects.

During the year, investigations and reviews of reports (other than special resource-consultation reports) included 64 for the Corps of Engineers, 31 for the Federal Power Commission, and 41 for the Department of Agriculture. Special detailed resource reports were prepared on 20 proposed Federal and non-Federal project areas involving water, timber, and recreation. Nine others were in process at year's end.

The Bureau also supplied information to the Basin Study Commissions recently established for the Southeast and Texas.

Missouri Basin Project

Nine preliminary reports were completed for the Missouri Basin project, describing mineral resources and research related to water- and power-development planning and progress was made on others. These included reports on mining and processing minerals for canal lining, coal, petroleum and natural gas, clay, and many other minerals.

Mineral-reconnaissance surveys were completed for the Department's Bureau of Reclamation on seven proposed reservoir sites.

Experiments on Dakota lignite showed that power requirements for pulverizing frozen lignite are significantly higher and the maximum feed rate attainable is lower than with unfrozen material—differences important to lignite-burning power stations. Experiments in the laboratory and at the Garrison Dam stockpile demonstrated the freezeproof character of partly dried lignite.

Cooperative research with the Bureau of Reclamation demonstrated that seepage is reduced significantly when certain sodium salts are added to the clay used for canal linings.

An inventory of water-borne mineral wastes is being made to pinpoint resources now lost which may be salvaged and utilized.

A sample survey of 52 mineral-industry plants in the Missouri basin showed their combined new water requirements to be 56,800,000 gallons per day compared to an average demand by Denver of 112,500,000 g.p.d.

The plants recirculate 210,500,000 g.p.d., consume 8,600,000 g.p.d., and return to the streams 48,200,000 g.p.d. The volume of recirculated water indicates the importance of water and its conservation to the mineral industry.

Special Economic Studies

Economic conditions of the domestic metal-mining industries and the domestic petroleum industry were investigated during fiscal 1959, since many proposals to help the domestic mining industries were submitted to Congress and an import quota plan for lead and zinc was instituted by the President in October 1958.

The Bureau analyzed the effects upon supply, demand, employment, and price of each alternative and provided technical analysis to aid in establishing import quotas. Fiscal 1959 began with relatively depressed economic conditions, and ended with rapid recovery. The Bureau studied the effect on mining of these swings in economic activity, both nationally and on a local level.

A major study of supply, demand, and production capacity of crude oil, done at the request of the office of Civil and Defense Mobilization, developed historical relationships between price, production, gross national product in constant dollars, drilling activity, capacity, reserves, consumption of petroleum products, and other related variables. The historical patterns were used to project demand, production, and capacity to 1975 under alternative import assumptions, and a linear programming model of the "transportation" type was developed, analyzing the cost to the economy of interruption of particular supplies from overseas.

Studies were begun to gage the effect of the European Common Market on mineral trade, specifically to prepare for large-scale multilateral tariff negotiations to be undertaken under the renewed Trade Agreements authority. Analysis of the complex trade-and-tariff structure involves detailed examination of trade patterns, supply and demand, import restrictions of all types, and possible institutional changes, such as international commodity agreements.

Public Reports

Manuscripts describing Bureau research and other findings totaled approximately 650 during the Fiscal Year, about the same as in the previous year. A significant accomplishment was the publication of 7 Minerals Yearbook volumes in a single year, thus erasing a

lag that had developed because of the press of other work in World War II. Among the other publications issued were 157 separate preprint chapters of the Yearbook, 83 reports of investigations, 68 information circulars, and 29 miscellaneous reports. Bureau authors also prepared 264 articles for journals and technical meetings.

The circulation of the Bureau's industry-sponsored 16 mm. sound motion pictures continued at a high level. Showings totaled 228,348 to group audiences of 12,658,584. Cooperating distributing centers at school systems, public libraries, and colleges stood at 187. Approximately 5,800 prints were in circulation.

Among the new film subjects added during the year were "Rubber from Oil," and "Asbestos—A Matter of Time." Three new films were in production at year's end.

Administration

During fiscal year 1959, the Bureau continued to emphasize efficient administration of its varied scientific and technical programs. Significant improvements are summarized in the following sections:

Organization and Management

Several organizational changes were made in the Bureau's five regions and in its Health and Safety Activities to promote more effective utilization of scientific personnel. Wherever possible, research workers were relieved of administrative responsibilities and encouraged to direct their energies into the areas of science in which they are most proficient.

Accomplishments at Bureau field installations and at Washington headquarters showed a mounting interest in the Department of the Interior's management improvement program. Studies to improve organization, communications, and technical-report writing predominated. Three Bureau-wide management-improvement projects were begun in January 1959 to: (1) Identify and resolve problems in publishing results of technologic investigations and resource and economic studies; (2) improve monthly reports to the Director and the Secretary, and (3) study retirement attrition and forecast its influence on organization and training of Bureau of Mines personnel.

Two regions issued regulations and instructions supplemental to, and in the format of, the Bureau of Mines Manual. Using the manual's numerical designations to classify such material helped maintain regional instructions with related Bureau-wide and Department-wide instructions. Regions III and IV serial administrative orders have been discontinued.

Property

The Bureau's use and disposal of excess and surplus personal property is shown in the following table:

Fiscal year	Obtained from other Government agencies	Fair value of property obtained	Disposal value ¹
1959.....	\$476, 474	\$5, 840	\$217, 825
1958.....	612, 970	7, 016	266, 240
1957.....	88, 970	2, 498	388, 658
1956.....	190, 451	3, 210	728, 496
1955.....	57, 597	3, 350	332, 812

¹ Personal property disposed of through donation, abandonment, sale, and transfer to other Government agencies.

Emphasis was placed on the Records-Management Program during the year, and 23 employees attended records-management conferences throughout the country. Records holdings were reduced 12,539 cubic feet during the fiscal year.

Finance

The Bureau continued its orderly improvement of accounting functions relating to coordinating financial management to serve the needs of technical programs during the year. By revising manual material and by periodic visits to field offices, accounting activities are being integrated with the technical policies and practices of the Bureau.

The Bureau of Mines accounted for funds totaling \$67,849,545, which includes direct appropriations, prior-year balances available, reimbursements, advances and transfers from other Government agencies, and proceeds from non-Government sources. Of this amount, \$51,490,499 was obligated, leaving an unobligated balance of \$16,359,046.

Funds available and obligations incurred, by source, fiscal year 1959

	Funds available	Obligations incurred
Conservation and development of mineral resources.....	\$21, 508, 978	\$21, 344, 521
Health and safety.....	6, 371, 283	6, 324, 265
Construction.....	13, 900, 702	12, 680, 243
General administrative expenses.....	1, 195, 029	1, 191, 096
Anthracite mine drainage.....	6, 819, 059	954, 907
Consolidated working funds.....	2, 893, 768	2, 512, 634
Transfer appropriation accounts.....	1, 274, 725	1, 109, 185
Contributions from non-Government sources.....	1, 213, 563	874, 004
Helium operations.....	12, 672, 438	¹ 4, 499, 644
Total.....	67, 849, 545	51, 490, 499

¹ Accrued expenditures.

Training

An employee was appointed to provide technical direction to Bureauwide training activities. Three employees participated in the Departmental Management-Training Program; one participated in the Departmental Manager-Development Program. Special training agreements with the U.S. Civil Service regional officer provided for training four Health and Safety employees in administrative procedures. The Bureau's Advisory Committee on Training and Development of Employees was increasingly active in matters concerning general training policy and implementation of the Government Employees Training Act. A Training Actions Subcommittee was formed in Washington, D.C., to consider requests for training employees at non-Federal facilities. Regional and activity committees were established to advise Bureau officials on training needs and desirable training activities, and to screen applicants for training.

Labor Relations

More staff assistance was provided on labor relations, particularly to the Helium Activity. This included assistance on a union decertification hearing and interpreting and applying recently issued departmental labor-relations policies and instructions.

Staffing

A Bureau-wide Merit-Promotion Plan covering positions in grades GS-13 and above and local merit-promotion plans for positions in grades GS-12 and below were developed and placed in operation. These plans involved extensive consultation with employees and employee groups, including employee unions.

A Coal-Mine-Inspector register, created under new examining techniques, was established during the year. The new methods included a written examination, personal interview, and evaluation of experience based on identification and evaluation of the job elements that comprise a coal-mine inspector position (J-Coefficient technique). A new Safety-Representative examination has been developed and validated, involving techniques similar to those of the Coal-Mine-Inspector examination.

Employee Safety

The Bureau won the Department's Annual Safety Award for its safety program and outstanding safety record in calendar year 1958. A Radiation Safety Training Seminar was held at its Pittsburgh station during the fall.

Classification and Wages

In addition to usual activities to assure compliance to classification requirements, Bureau personnel made field trips, reviewed wage schedules and amendments, submitted comments on tentative classification standards, and provided administrative training in classification and wages.

Civil Service Examining Board

During the year, 93 certificates and 1 Civil Service Commission Form 303 were issued. A summary of the Washington Board activities for fiscal year 1959 follows:

Active registers.....	118
Examinations announced.....	0
Applications received.....	1, 064
Applications rated.....	1, 043
Applications rated eligible.....	376
Placements.....	90

Schedule and number of paid employees

	GS		Ungraded		Total	
	1958	1959	1958	1959	1958	1959
Departmental.....	646	652			646	652
Field.....	2, 920	2, 932	904	894	3, 824	3, 826
Total.....	3, 566	3, 584	904	894	4, 470	4, 478

Incentive Awards

A comparative tabulation of incentive awards in the past 5 years reveals some changes of emphasis in the program. For example: greater attention is now given to Superior Performance Awards and Special Service Awards.

	1955	1956	1957	1958	1959	Total
Suggestions received.....	245	497	971	752	788	3, 253
Suggestions adopted.....	66	157	320	263	299	1, 105
Cash awards granted for adopted suggestions.....	\$1, 160	\$5, 040	\$8, 520	\$6, 750	\$7, 485	\$28, 955
Superior performance awards granted.....	2	44	57	76	105	284
Cash awards presented for superior performance.....	\$400	\$9, 015	\$16, 464	\$18, 200	\$28, 300	\$72, 379
Special service awards granted.....		2	3	5	4	14
Cash awards granted for special service awards.....		\$400	\$1, 300	\$2, 250	\$1, 200	\$5, 150
Total estimated annual savings realized from adopted suggestions and superior performance.....	\$72, 297	\$32, 297	\$63, 484	\$44, 995	\$1, 026, 000	\$1, 239, 700
Honorary awards granted.....	38	45	38	52	72	245
Length-of-service awards granted.....				2, 190	239	2, 429

Office of Oil and Gas

Capt. Matthew V. Carson, Jr. (USN), *Director*



THE OFFICE OF OIL AND GAS is the staff agency of the Department which assists and advises the Secretary of the Interior and the Assistant Secretary for Mineral Resources in the discharge of their responsibilities concerned with the development, coordination, and management of petroleum and gas programs assigned to the Department by the President and Congress.

In addition to its domestic activities, it has important international duties, particularly in support of NATO planning and in providing petroleum guidance in connection with development of U.S. foreign policy. The Office of Oil and Gas is the focal point for coordination and leadership in governmental oil and gas activities. By keeping abreast of oil production, refining, transportation, storage, gas transmission and distribution in the United States and the rest of the world, it is in a position to provide detailed guidance on problems and policies having an impact on petroleum and gas supply.

The Office of Oil and Gas maintains direct channels of communications with the petroleum and gas industry through the National Petroleum Council, Military Petroleum Advisory Board, and the Foreign Petroleum Supply Committee, all of whose members are appointed by the Secretary of the Interior.

The director of the Office of Oil and Gas maintains close liaison with the State regulatory agencies in the petroleum and gas producing states, and with the Interstate Oil Compact Commission through participation at its meetings in his official capacity as the Department's representative to IOCC. At a public hearing in May 1959, the Director presented to the Congress a departmental report for favorable action on extension of the interstate compact to conserve oil and gas for another 4 years from September 1, 1959.

This year the Office of Oil and Gas furnished technical advice and assistance directly to many Federal agencies, and maintained repre-

sentation on interagency committees. Staff members served on the State Department Committee which provided backstop support for the U.S. Delegation to the NATO Petroleum Planning Committee, and on State's special committees which collaborated with other government agencies in dealing with foreign oil problems involving free world petroleum supply and demand. Office officials also participated in the defense mobilization committee activities of OCDM, particularly those concerned with national security policy involving petroleum and gas. Staff support was given to departmental offices through the development of specific information and the preparation of reports, as well as representation on departmental task groups that deal with legislative matters, Executive Reserve, coordination of defense and mobilization activities, and administrative management.

Highlights of the fiscal year 1959 include:

Plans for Petroleum and Gas in an Emergency

Preemergency readiness measures are being developed to assure, insofar as possible, adequate supplies of petroleum and gas in a national emergency. This year the Office completed a detailed statement of the emergency responsibilities of Federal, State, and local governments, as well as industry itself, for maximizing the production, transportation, processing, storage and distribution of petroleum and gas. Measures by which these responsibilities would be carried out in a period of international tension, limited war, or general war are delineated. The guidance will be published in annex 33 to the OCDM National Plan for Civil Defense and Defense Mobilization.

To carry out these emergency responsibilities, The Office of Oil and Gas has developed a plan for operational direction and control of the petroleum and gas industries. It provides for the establishment of a national agency and field offices in the eight OCDM regions and in each State to carry out the functions outlined in the foregoing annex. The National Petroleum Council is reviewing this plan and assisting the office to recruit staff for the emergency organizations by furnishing names of qualified oil and gas specialists who would be subject to call if needed as members of the National Defense Executive Reserve of the Department of the Interior.

Civil Defense Exercises

Nationwide exercises are held annually to examine the readiness of the Nation to meet a nuclear attack on the United States and to

test our capabilities to withstand and survive such an attack. The Office of Oil and Gas has the responsibility for pre-planning to cope with the problems of oil and gas supply and distribution. The Office participated in all phases of the Operation Alert exercises conducted in 1958 and 1959, and was also involved in the independent exercise conducted to test Federal communications facilities. In addition, personnel served with the departmental cadre which manned the Relocation Center during the year.

Detection and Measurement of Radioactivity

During the year, a team of departmental employees, including an official of the Office, developed and conducted a course in radiological monitoring of fallout caused by atomic explosions. The course is being given to petroleum and gas, coal and electric power industry groups, and to Government officials. This 34-hour course provides training on the use of instruments to detect and measure radioactivity. Two staff members and six members of the oil and gas industries have taken the course. Radiological monitoring of fallout being highly important to the continuity of petroleum and gas industry operations, arrangements will be made to extend the training to a large number of industry personnel next year.

Emergency Port Facility Study

An elaborate emergency tanker loading and unloading study providing detailed data regarding facility capability was completed for the Department of Defense. Work on this project took up much of the time of one member of the staff for some months as it was necessary to visit all U.S. coastal areas in order to study the facilities and to obtain firsthand information from management personnel.

Long-Range Petroleum Study

The background studies of U.S. supply capabilities and requirements of petroleum upon which to base a long range national security policy were approaching the final stages of preparation within the Department as the fiscal year ended. The Office is coordinating departmental activities in connection with this study requested by OCDM, and both the Department's Geological Survey and its Bureau of Mines are participating in the work.

NATO Petroleum Planning Committee

Technical advice and assistance was given to the NATO Petroleum Planning Committee during the fiscal year. As a member of the United States delegation, the Director attended committee meetings held in Paris, France, during January. An Assistant Director of the Office served as chairman of the Working Group which developed and carried on oil supply-demand and related studies that are essential in NATO defense planning and the preservation of petroleum security. This Working Group held meetings in Paris during October 1958 and April 1959.

Foreign Petroleum Supply Committee

Authority exists for taking action under the Voluntary Agreement Relating to Foreign Petroleum Supply as amended May 8, 1956, should an emergency arise outside the United States which would threaten to affect or adversely affect the defense mobilization interests or programs of the United States. As established, pursuant to section 708 of the Defense Production Act of 1950 as amended, Secretary of the Interior Fred A. Seaton, or the Assistant Secretary of the Interior for Mineral Resources Royce A. Hardy, serve as Administrators of the agreement.

To assist in accomplishing the objectives of the agreement is the Foreign Petroleum Supply Committee composed of senior officials of 16 American oil companies engaged in foreign petroleum operations. The Director of the Office of Oil and Gas is its Chairman.

FPSC performs two principal functions: (a) When requested by the Department, it provides advice on how the Government may obtain needed information relating to foreign petroleum operations and to requirements and supplies of petroleum. (b) It may consider and make recommendations designed to prevent, eliminate, or alleviate shortages of petroleum supplies in friendly foreign nations threatening to, or adversely affecting, the defense mobilization interests or programs of the United States.

Secretary of the Interior Fred A. Seaton called the FPSC into session on July 23, 1958, to explore the oil supply conditions in the light of threatening conditions in the Middle East. The Government of Iraq had fallen. American troops were stationed in Lebanon and British troops in Jordan at the request of the respective governments of these countries. The members of the Committee were asked to comment on a plan of action worked out by several Government agencies in order that action might be taken quickly should the need arise. Subsequent developments in the Middle East rendered unnecessary putting the proposed plan in effect.

National Petroleum Council

Amendments to the National Petroleum Council's articles of organization were worked out during the year to satisfy the procedural requirements established by the Attorney General for functioning of industry advisory groups. The modifications contain provisions for appointment of fulltime officials of the Department of the Interior as Co-Chairman of the Council and its study committees, for procedures in the appointment of members of the Council's committees and subcommittees, for the call and conduct of meetings, formulation of agenda, and the preparation and custody of minutes.

NPC met once during the fiscal year. At the meeting held January 27, 1959, the Council adopted the amendments and agreed to undertake assignments to comply with three requests for reports and information needed by Government. Study committees have been organized and the work was in progress when the fiscal year ended.

Incentive of Accelerated Tax Amortization

As accelerated tax amortization under the Internal Revenue Code for oil and gas projects has expired, activities were limited to the preparation of twenty reports and recommendations to OCDM on requests for post certification actions on certificates of necessity issued earlier by OCDM.

Office of Minerals Exploration

Frank E. Johnson, *Acting Director*



THE OFFICE OF MINERALS EXPLORATION of the Department of the Interior was established by the Secretary of the Interior on September 11, 1958, to conduct a program of Federal financial assistance in exploration for mineral reserves, excluding organic fuels, in the United States, its Territories and possessions pursuant to Public Law 85-701 enacted August 21, 1958.

The OME is also administering contracts in force and certified projects remaining from the exploration program conducted from mid-1951 to June 30, 1958, by the Department's former Defense Minerals Exploration Administration, under the Defense Production Act of 1950, as amended. The DMEA contracts in force on June 30, 1958, have been continued in accordance with the contract provisions until terminated. The amount of the Government's financial commitment in any of these contracts, however, has not been increased where the results have progressed to a point at which a certification of discovery or development could be issued.

The New OME Program

The proposed regulations for the new OME program were published in the Federal Register on September 17, 1958. Interested parties were given 30 days to submit written comments, suggestions, or objections concerning them to the Director of OME. On December 23, 1959, the regulations under which OME operates were published in the Federal Register.

New forms, procedures, and instructions regarding the OME program were devised and issued. The new application forms were made available to the public in January 1959, and more than 1,200

requests for these forms were filled before the end of the fiscal year. The first OME application was received in February and the first contract was executed in May 1959.

Administration of OME

Under the OME program, the Government participates to the extent of not more than 50 percent of the allowable costs in exploring for minerals, excluding organic fuels, but the amount of the Government's contribution is limited to \$250,000 on any one contract. The following mineral commodities are eligible for Federal financial assistance: Antimony, asbestos (strategic), bauxite, beryl, cadmium, chromite, cobalt, columbium, copper, corundum, diamond (industrial), fluor spar, graphite (crucible flake), kyanite (strategic), lead, manganese, mercury, mica (strategic), molybdenum, monazite, nickel, platinum group metals, quartz crystal (piezoelectric), rare earths, rutile-brookite, selenium, talc (block steatite), tantalum, thorium, tin, uranium, and zinc.

After careful investigation, based upon sound geological and engineering principles, the Government enters into a contract with an operator to explore for one or more of these mineral commodities. In passing upon applications for Federal financial assistance the following factors are considered and weighed:

(a) The geological probability of a significant discovery being made.

(b) The estimated cost of the exploration in relation to the size and grade of the potential deposit.

(c) The plan and method of conducting the exploration.

(d) The accessibility of the project area.

(e) The background and operating experience of the applicant.

(f) The applicant's title or right to possession of the property.

(g) The unavailability of funds from commercial sources on reasonable terms.

(h) Whether the applicant would normally undertake the exploration at his sole expense under current conditions or circumstances.

Provisions of Contract

The exploration work in which the Government will share in the cost is set forth in the contract with the operator who performs the work. The contract specifies the land involved, the work to be done, the allowable costs, the dates for starting and completing the work, the total amount of the contract, and the amount of the Gov-

ernment's participation. It contains the standard provisions of Government contracts relating to nondiscrimination, settlement of disputes, 8-hour law, and rebate of wages.

The contract also provides for repayment of the Government's contribution with interest by a royalty on production from the property subject to the contract. If there is no production, there is no obligation to repay. Royalty payments of five percent of the gross proceeds or value are required on any production from the date of the contract until the Government notifies the operator, not later than 6 months after an acceptable final report and an accounting have been furnished, either that it certifies that mineral or metal production may be possible as a result of the exploration or that it does not intend to issue such certification.

If the Government issues a certification, the operator, or his successor in interest, is required to continue to pay the royalty on all production from the property until the Government's contribution with interest is fully repaid or until the period fixed in the contract for royalty payments (usually 10 years but not more than 25 years) has elapsed, whichever occurs first.

Payment of Interest

Simple interest is calculated from the date Federal funds are made available to the operator until the period specified for royalty payments expires or until the amount of Federal funds contributed, including interest, is fully repaid by the royalty on production, whichever occurs first. The rate of interest is not less than the rate which the Department of the Interior would be required to pay if it borrowed from the Treasury, plus a 2 percent interest charge in lieu of the actual cost to the Government of administering the contract.

The OME employs a small staff in the Washington Office and two field auditors to administer the OME program and liquidate the DMEA program. Administrative services available from the Office of the Secretary and the Solicitor's staff of the Department of the Interior are utilized in the program. The staffs of the Bureau of Mines and the Geological Survey—both agencies of the Department—are used to administer the program in the field.

During the period of this report the OME reduced its staff from 33 to 22 employees because of budgetary limitations and anticipated reduction in workload. This reduction was accomplished by not filling vacancies caused by retirements and transfers, so that only four reduction-in-force notices were given to employees to effect the reduction. The Bureau of Mines and Geological Survey effected

comparable reductions in the numbers of employees assigned to OME work during this period.

In order to effect more efficient operations and reduce administrative costs, three of the OME Commodity Divisions were abolished and the Region IV field office is being abolished and its work transferred to Regions III and V. So as to consolidate the work, the Region II office at Reno, Nev. is being transferred to San Francisco, Calif. and the region III office at Denver, Colo. is being transferred to the nearby Federal Center.

Summary of OME Operations

OME operations for the fiscal year 1959 are summarized under the headings below:

Applications

During the fiscal year, 57 applications were received from 19 States requesting financial assistance in exploration for 19 different mineral commodities. Actions taken on these applications are shown in the following tabulation:

OME Application Summary

Action	Number
Received.....	57
Denied.....	12
Withdrawn.....	7
Pending as of June 30, 1959.....	30
Contracts executed.....	8

Contracts

The OME executed 8 contracts in 7 States covering 5 mineral commodities as shown in the table below:

OME contract summary

No.	State	Commodity	Amount of contract	Amount of Government participation
1.....	Idaho.....	Lead-Zinc-Copper.....	\$43,550	\$21,775
1.....	Montana.....	Lead-Zinc.....	13,900	6,950
2.....	New Hampshire.....	Mica.....	9,850	4,925
1.....	North Carolina.....	Mica.....	8,464	4,232
1.....	Oregon.....	Mercury.....	47,910	23,955
1.....	Utah.....	Lead-Zinc.....	43,926	21,963
1.....	Virginia.....	Lead-Zinc-Copper.....	12,990	6,495

Summary of DMEA Operations

The DMEA operations for fiscal year 1959, and for the entire program are summarized under the headings below:

Applications

Applications under the DMEA program were not accepted after June 30, 1958; however, 65 DMEA applications received prior to that date were in various stages of processing on termination of the program. The applicants were informed their DMEA applications would be processed under the OME program upon written request. Fifteen of these 65 DMEA applicants have reapplied under the OME program, 7 have stated their intentions to refile under the OME program, 12 have indicated they were no longer interested in proceeding with their applications, and 31 have not replied to the letters sent to them in regard to their applications.

Contracts

On June 30, 1958, 170 DMEA contracts remained in force. This number was reduced to 50 by the end of this fiscal year. The tabulation below summarizes DMEA contract data for fiscal year 1959, and the entire program:

DMEA contract summary

Contracts	Fiscal 1959			Program through June 30, 1959			
	Number	Costs	Government participation	Number	Total estimated costs	Government participation	Government participation spent
Contracts as originally executed.....				1, 159	\$50, 547, 489	\$31, 056, 412	
Amendments which changed contract amounts.....	3	\$4, 071	\$2, 056	218	6, 244, 262	3, 761, 478	
Contracts plus amendments (net).....					56, 802, 182	34, 823, 125	\$22, 758, 601
Projects certified as discoveries.....	37	3, 632, 310	2, 333, 535	¹ 374	25, 443, 931	16, 023, 763	12, 969, 781
Projects terminated without certification.....	64	4, 350, 832	2, 639, 896	661	21, 835, 812	13, 576, 132	7, 867, 267
Contracts canceled without Government expenditure.....	9	213, 931	122, 539	80	2, 133, 553	1, 304, 390	
Contracts in force as of June 30, 1959 not certified.....				44	7, 388, 886	3, 918, 840	1, 921, 591

¹ Includes 6 projects in force. Also included are figures relating to 2 projects which were certified though canceled, i.e., no Government funds were spent.

Certifications

During the fiscal year 1959, 37 Certifications of Discovery or Development were issued on DMEA projects. The total of such certified projects is now 374. (See table I.)

DMEA Ore Potential and Royalties

The recoverable mineral commodities found on the 374 certified DMEA projects are estimated to have a gross value of \$625,000,000 based upon market prices in effect at the close of the fiscal year. Substantial additions to this estimate are anticipated from the 44 uncertified DMEA contracts remaining in force on June 30, 1959.

Royalties collected incident to the sale of materials found under the DMEA contracts continued at a relatively high rate during fiscal 1959. A total of \$620,834 has been received during this year, and \$3,127,068 since the start of the program. Forty-three projects have repaid in full the amounts contributed by the Government to them, namely \$1,268,217.

DMEA royalty summary

Type of project paying	Program through June 30, 1959	
	Number	Amount received
Certified as a discovery or development.....	272	\$2, 860, 253
Royalty agreement (qualified certifications).....	20	76, 532
Not certified (obligation to pay derives from contract).....	107	190, 283
Total.....	399	3, 127, 068

DMEA Audits

By the end of the fiscal year, approximately 93 percent of the DMEA contract disbursements had been audited. The details of the audit program are shown in the following table:

DMEA audit summary

Audits	Fiscal 1959	Program through June 30, 1959
Cost audits:		
Number made.....	110	1, 227
Number of projects audited.....	97	1, 038
Costs claimed by operator.....	\$4, 908, 576	\$34, 944, 708
Participation certified by audit.....	\$2, 875, 763	\$21, 040, 959
Royalty audits:		
Number made.....	145	434
Number of projects audited.....	100	312
Production subject to audit.....	\$8, 221, 772	\$36, 256, 807
Amount of royalty payable.....	\$402, 435	\$1, 771, 024

DMEA projects certified—Distribution by State and commodity (as of June 30, 1959)

	Antimony	Asbestos	Beryl-Mica	Chromium	Cobalt-Nickel	Columbium-Tantalum	Copper	Corundum	Fluorspar	Iron	Lead-Zinc	Lead-Zinc-Copper	Manganese	Mercury	Mica	Monazite	Rutile	Sulphur	Talc	Thorium	Tin	Tungsten	Uranium	Total
Alabama	2									1				1	2						2	1		3
Alaska		4					5				3	2		1								3		18
Arizona													2	1										2
Arkansas				1			1			1	1	3	1	6								8	1	23
California			2						1		10	2								3		11	26	55
Colorado																	1							1
Florida													1		4									6
Georgia	1		1		3	1	1		3		14	3			1	3						4		31
I Idaho																								1
Illinois											1													3
Iowa			1																					1
Maine																								1
Michigan							2																	2
Missouri					1						2													3
Montana							1				4	1	5		1							6	1	19
Nevada							1	1	1		3		1	2								14		23
New Hampshire															1						1			1
New Jersey										1														1
New Mexico													2		58				1			1	5	11
New York											2			2										61
North Carolina						1																		2
Oregon											1													1
South Carolina			5												1	1					1		1	9
South Dakota											1													2
Tennessee											2													1
Texas														1										2
Utah							1		1		10	1										4	30	47
Vermont		1					1																	1
Virginia													1											2
Washington	1										6	1	1				1					1	1	12
Wisconsin							2				10													10
Wyoming																		1					13	14
Total	4	5	9	1	4	2	17	1	6	3	69	14	13	13	68	4	2	1	1	3	3	53	78	374

Office of Minerals Mobilization

Spencer S. Shannon, *Director*



THE OFFICE OF MINERALS MOBILIZATION carries out the Department of the Interior's responsibility for national defense preparedness in metals, minerals and solid fuels, and for civil defense procurement, transportation and distribution of solid fuels, in accordance with basic policies and programs approved by the Office of Civil and Defense Mobilization.

During the past year, the Office maintained constant surveillance of the ability of the Nation to meet estimated national defense emergency requirements for the 85 strategic minerals, metals, and solid fuels from domestic wartime production, from wartime imports, and from the Government stockpiles. In cooperation with the Bureau of Mines and the Geological Survey of the Department, the Office evaluated changes in markets, prices, production, reserves, and productive capacity to insure that the Nation would maintain an adequate domestic production component of the mobilization base for strategic metals, minerals and solid fuels. Special attention was given to those strategic metals and minerals which are experiencing market difficulties.

During fiscal year 1959 comprehensive mobilization evaluations were completed on beryl, fluorspar, columbium-tantalum, tungsten and a review was made of the July 1958 fluorspar study. Supply studies were also made on asbestos and copper.

Two revised evaluations were made on high temperature and special-property materials. The original study on this subject was made in December 1957 at the request of the Chairman of the OCDM Special Stockpile Advisory Committee. Since that time, the Office has followed closely the rapidly changing development in this field of materials and has prepared revised reports on a semi-annual basis.

Reports were also made on the effect of imports on the national security on cobalt, fluorspar and tungsten in connection with section 8 of the Trade Agreements Act.

The Office advised and assisted the Office of Civil and Defense Mobilization in carrying out the stockpiling programs. Problems relating to disposal of Government inventories of metals and minerals in excess of national defense requirements required increased attention during fiscal year 1959.

The Director served as the Department's representative on the Interagency Materials Advisory Committee and on the Supplemental Stockpile Advisory Committee for Barter on acquisition by barter of materials for the Supplemental Stockpile in exchange for U.S. surplus agricultural commodities.

During the year 14 additional industrialists were appointed to the OMM unit of the National Defense Executive Reserve to be available to serve in the event of a national emergency. In April, and again in May, various members of the Reserve were brought to Headquarters for training.

The Office assembled and transmitted to emergency relocation sites essential documents to permit continuity of government in case of an emergency. It prepared input data for use in the National Damage Assessment Center computing machines on theoretical damage to metals, minerals and coke producing facilities.

At the end of fiscal year 1959, State Agreements had been negotiated with 27 States and the District of Columbia on OCDM programs for emergency distribution of solid fuels.

Office of Geography

Meredith F. Burrill, *Director*



THE DEPARTMENT'S OFFICE OF GEOGRAPHY provided the staff service for the Board on Geographic Names and the Secretary of the Interior, except that after October 1, 1958, staff service relating to domestic names was provided by the Geological Survey. The statistical information on production is included in the report of the Board. The gazetteers referred to represent thorough revision and severalfold enlargement of previous files of official standard names for those areas.

In the revision process many kinds of toponymic problems were brought into focus and increasing attention was devoted to the coordinated joint geographic-linguistic research that is necessary to solve them. A beginning was made in the formulation and statement of toponymic principles and theory that may bring significant advances in the quality and usability of the standardized names.

Board on Geographic Names

Walter W. Ristow, *Chairman*

Meredith F. Burrill, *Executive Secretary*

THE INTERDEPARTMENTAL BOARD on Geographic Names was established under Public Law 242, July 25, 1947, entitled "An Act to provide a central authority for standardizing geographic names for the purpose of eliminating duplication in standardizing such names among the Federal departments, and for other purposes."

The Board is composed of representatives of the Departments of Interior, State, Army, Navy, Post Office, Agriculture, Commerce, and Air Force; the Government Printing Office, the Library of Congress and the Central Intelligence Agency.

The Board establishes policies under which geographic names are standardized, approves transliteration and transcription systems as may be necessary for the romanization of names, and approves individual names for use in Federal publications.

The Department of the Interior maintains the standard name files and other records of the Board and provides staff assistance to the Board. Under Departmental Order No. 2829, dated July 10, 1958, the records, name files, and staff functions relating to domestic geographic names were transferred from the Office of Geography to the Geological Survey. Records and functions relating to foreign names were continued in the Office of Geography.

In 1959, the Board approved for publication in gazetteers more than 450,000 names, including about 300,000 standard names and 150,000 variant names, covering principally the U.S.S.R. and certain neighboring areas, the Baltic States, Bulgaria, the Soviet Zone of Germany, and Egypt. Nomenclature policies were reviewed and revised as necessary for the above areas and numerous other foreign areas as required by the various agencies. Editing of names on maps and in texts was performed on a moderate scale and more than 16,000 name inquiries were answered by telephone and mail.

Transliteration systems for Burmese, Cambodian, and Amharic were under study with a view toward possible adoption jointly with other English-speaking nations. The Board's advisory committees on Antarctic Names and on Arabic and Persian were active in their areas of special interest.

Some 1,200 proposed domestic name decisions were issued on docket lists, some 600 names were approved, and a decision list containing 879 names was published.

Office of the Assistant Secretary

Public Land Management

Roger Ernst, *Assistant Secretary*



THE ASSISTANT SECRETARY for Public Land Management, in discharging the Secretary's duties in that field, directs and supervises the Bureau of Land Management, the National Park Service, the Bureau of Indian Affairs, and the Office of Territories.

The last-named agency celebrated with Hawaii as that territory won Statehood to climax its 50-year campaign for full membership in the Republic. Alaska had achieved congressional approval on the last day of fiscal 1958, but was not formally admitted until January 3, 1959. Hawaiians endorsed their new status at the polls by the thunderous majority of 17 to 1. Hawaii formally became a State shortly after the close of the fiscal year, on August 21, 1959.

In other areas administered by the Office of Territories, American Samoa reeled under the blows of a typhoon, while the Trust Territory of the Pacific Islands was still fighting its way back to economic recovery from the damage caused by the previous year's typhoons. Despite storm damage, Samoa's economic gains were gratifying. The same was true of Guam.

The Virgin Islands forged ahead in tourism and other fields. The territory's total revenues reached a record high. The Government-owned Virgin Islands Corporation received authorization to build a saline water distillation plant which will also produce electrical power. The Alaska Railroad, also Government-owned, and paying the highest railroad wages of any line in the world, showed a net profit of more than \$200,000 above the previous year.

The Bureau of Indian Affairs continued its emphasis on educating Indian children to equip them for a richer life. School enrollment reached the all-time high of 132,000, with 61 percent of the young-

sters in public schools where they have the advantage of studying with non-Indians. Construction projects were speeded and will provide more than 1,000 additional classroom seats in fiscal 1960.

Tribal leaders and private Indian interest groups hailed Secretary Seaton's statement at Window Rock, Ariz., on September 18, 1958, which reviewed the stated intentions of Congress to free Indian tribes from Federal supervision, at the earliest possible time, or practicable date, and declaring what the Congress expressed in its resolution of 1953 "was to state an objective, not an immediate goal."

Adult education programs were continued at 80 different locations on reservations and in Alaska's native villages. Contract arrangements were worked out to provide adoptive homes for Indian waifs.

On the Klamath Reservation in Oregon plans advanced for permitting the withdrawing members to manage their own affairs. Forest lands and other properties belonging to the nonwithdrawing members were transferred to a private trustee for management. The Menominees of Wisconsin were given conditional acceptance of their multiphased plan for taking over their property and affairs.

Two new industrial plants were established near reservations in Oregon and North Carolina, offering additional job opportunities.

Oil and gas lease income paid more than \$46.5 million to tribes and individual Indian landowners during the year. Timber sales brought in about \$10 million more.

The Bureau of Land Management, landlord of the public domain, had gross receipts totaling nearly \$137 million from its sale and management of the public lands and resources during the year. The money was distributed to the General Fund of the United States Treasury, to 27 public land States, the Reclamation Fund, Indian Trust funds, other Government agencies and to grazing districts to be used for improving the range. Fiscal 1959 receipts pushed the Bureau's total receipts to more than \$1.2 billion since the Bureau was organized in 1946.

The Bureau adopted "protracted surveys"—lines drawn on maps where boundaries have not been laid out on the ground—and the system will help Alaska select the more than 103 million acres granted in its Statehood Act.

Cracking down on violators of oil and gas lease acreage limitations, the Department initiated three contest proceedings against individuals charged with obtaining acreage holdings in excess of the limitations of the Mineral Leasing Act.

As in past years, fires wrought terrific damage on public lands. But new and better protective systems kept the loss from being

even worse. The Bureau has given a high priority to its smoke-jumper operation in Alaska, where airborne firefighters in parachutes are needed to combat fast-breaking flames in roadless areas hundreds of miles from settlements.

With oil and gas leasing of the public lands at the highest point in history, the lands yielded more than 132 million barrels of petroleum. Almost 2 billion board feet of timber from public lands brought more than \$32 million. During the year, 33,000 acres were reforested. Public lands provided grazing for more than 10 million head of cattle, sheep and horses, and wildlife. Leasing of the submerged lands on the Outer Continental Shelf, suspended during fiscal 1958, was resumed in fiscal 1959.

The Department, through the National Park Service, expended or obligated more than \$95 million for 1,418 projects, during the third year of its Mission 66 development program. Thirteen new visitor centers were completed. Twenty others were under construction. The road program provided for 117 miles of new or reconstructed routes.

Grand Portage National Monument and General Grant National Memorial were authorized, and a Secretarial order established the Minute Man Historical Site in Massachusetts.

The rate of park visits made it evident that the 80 million visits predicted for 1966, the 50th anniversary of the founding of the Service, was too conservative an estimate. The original Mission 66 plan is being restudied. Campers by the thousands showed that camping is growing in popularity among Americans.

But there are also many millions who want to sleep and eat indoors in the parks. Private enterprise spent some \$4.5 million to improve concessioner facilities for visitors. Sixteen new concession contracts were authorized during the year.

Ranger III, a new 96-passenger motor craft, entered service during the year to furnish adequate access to Isle Royale National Park.

Many new interpretative markers were installed along the sides of park roads and trails, informing the motorist or hiker of the significance of the areas. Archeological research went forward in a number of areas.

Almost 79,000 acres of inholdings were acquired. The Department submitted legislation, now pending in Congress, which would authorize the Secretary to select three shoreline areas for inclusion in the National Park System.

Bureau of Indian Affairs

Glenn L. Emmons, *Commissioner*



ONE OF THE MOST IMPORTANT DEVELOPMENTS of the year in Federal administration of Indian affairs was Secretary of the Interior Seaton's radio address of September 18, 1958, from Flagstaff, Ariz., clarifying the Department's position on the centrally important question of terminating Federal trust responsibilities for Indian tribal groups.

Referring to the resolution on this subject adopted by Congress in 1953 (H. Con. Res. No. 108 of the 83rd Cong.), Secretary Seaton called attention to the varying interpretations given to this document over the preceding 5 years and specifically mentioned the impression created by some interpreters that "it is the intention of Congress and the Department of the Interior to abandon Indian groups regardless of their ability to fend for themselves."

In his talk, Secretary Seaton strongly repudiated any such interpretation. "To me," he said, "it would be incredible, even criminal, to send any Indian tribe out into the mainstream of American life until and unless the educational level of that tribe was one which was equal to the responsibilities which it was shouldering."

At another point, he summarized his position succinctly in the following words: . . . no Indian tribe or group should end its relationship with the Federal Government unless such tribe or group has clearly demonstrated—first, that it understands the plan under which such a program would go forward, and second, that the tribe or group affected concurs in and supports the plan proposed."

Following the delivery of this talk, expressions of approval and support of the Department's position were received from many Indian leaders as well as from numerous private organizations active in the field of Indian affairs.

The one piece of new Indian terminal legislation enacted by Congress during fiscal 1959 was in full harmony with the Department's

position. It covers 41 small Indian groups in California which had explicitly asked for such legislation and provides for a referendum on each property distribution or termination plan before it becomes effective. By the end of the period 23 of the groups had submitted such plans and these had been tentatively approved by the Department. No referendum, however, had yet been held.

Klamath Amendment Enacted

Another development of salient importance in the field of termination legislation was the Congressional enactment of a major amendment of the 1954 terminal law affecting the Klamath Tribe of Oregon. The amendment was concerned with sale of the tribal property to compensate the withdrawing members. In brief, it provided for (1) joint action by the Secretaries of the Interior and Agriculture in designating the Klamath tribal forest lands requiring continuous sustained-yield management, (2) offering of these units to private purchasers subject to sustained-yield-management requirements, (3) Federal purchase of the Klamath marshlands as a national wildlife refuge, and (4) Federal purchase of the unsold forest units for addition to the national forest system. The maximum price to be paid for forest and marshlands together was set at \$90,000,000.

Following the enactment of this amendment in August 1958, action was taken to reappraise the tribal properties and to designate the sustained-yield-management forest units. Of the 11 units designated, four were offered for sale in April 1959, and the others will be offered in fiscal 1960. An area of about 145,000 acres was set aside for the remaining tribal members and was transferred to a private trustee in March 1959.

Apart from termination activity, the Department's Bureau of Indian Affairs made steady and substantial progress during 1959 in providing Indian people with better and broader educational and economic opportunities.

Enrollment of Indian children of school age in schools of all types increased by about 2 percent to an alltime-high figure of approximately 132,000. In schools operated by the Bureau, significant advances were made in adjusting the instructional programs to meet the needs of Indian pupils now arriving at school age. Adult education classes were continued on the reservations and were carried forward at 80 locations as compared with 75 in 1958. Grant funds were made available by the Bureau to help over 500 Indian students in obtaining an education beyond the high-school level.

Adult vocational training was made available during the year for

1,547 individual Indians as compared with 376 in fiscal 1958, which was the first year of operation for the program. In the field of industrial development, contacts were established by Bureau field personnel with over 400 concerns and new plants were started near the Umatilla Reservation in Oregon and the Cherokee Reservation in North Carolina.

Record Royalty Income

Income to Indian tribes and individuals from leasing of their lands for oil and gas development declined for the second year in a row from the record-smashing total of nearly \$72,000,000 which was reached in 1957. In 1959 the income from this source totaled \$46,587,458. This was the third highest figure ever recorded. Although there was a substantial decrease in bonus income during 1959, the increasing production on Indian (especially Navajo) lands was reflected in an alltime-high royalty income figure of \$30,172,382. This compared with \$18,453,532 in 1958.

Sales of timber from Indian lands advanced during the fiscal year and cash receipts from this source totaled about \$10,000,000 as compared with approximately \$8,250,000 the preceding year.

Education

Enrollment of Indian children of school age increased approximately 2 percent in fiscal 1959 as compared to the preceding year. Of the 132,000 enrolled, 61 percent attended public schools, 30 percent were in Federal schools, and 9 percent in mission and other private schools. Public school enrollment increased by approximately 2,300 students.

Although Indian children are entitled to free education in the public schools of the States where they reside, the Bureau of Indian Affairs for many years has been providing aid for public schools enrolling substantial numbers of Indian children residing on tax-exempt lands. These funds have been made available to help the schools in meeting undue financial burdens resulting from the enrollment of such Indian children and have been furnished under contracts negotiated with State and local school agencies in accordance with the provisions of the Johnson-O'Malley Act of 1934.

In fiscal 1959, a new Federal aid resource was made available to school districts educating eligible Indian children when Congress, by the act of August 13, 1958, amended Public Law 874, 81st Con-

gress (64 Stat. 1100). Under this amendment the Department of Health, Education, and Welfare was authorized to count Indian children from tax-exempt land in providing assistance to meet partial costs of normal school operations. In school districts qualifying for assistance for Indian children under Public Law 874, as amended, supplemental aid provided by the Bureau of Indian Affairs under the Johnson-O'Malley Act is limited to meeting educational problems under extraordinary circumstances including special services to the Indians that may best be made under education contract.

As a result, the Bureau spent considerable time in 1959 reviewing plans and operations to coordinate the programs and avoid duplication of aid. Because approximately one-half of the 1,026 local school districts participating under the Johnson-O'Malley program qualify for some Public Law 874 aid, the total expenditures for Indian Bureau education contracts covering Indian children attending public schools were reduced in 1959 to \$5,201,000 as compared to \$8,500,000 that would have been needed had the new Public Law 874 resource not been available. The need for 1960 is estimated at \$5,000,000.

285 Schools Operated

The Bureau of Indian Affairs in fiscal 1959 operated 285 schools with an enrollment of 41,182 including those under 6 and over 18 years of age. In addition, dormitory facilities were provided at 17 locations for 3,169 students who attended public schools. Pawnee Indian school, a reservation boarding school in Anadarko Area, five trailer schools and Towaoc Dormitory in the Gallup Area, and five instructional aid schools in Alaska were closed in 1959. Two of the instructional aid schools and one trailer school were operated as regular day schools with fully qualified teachers. Most of the students in the closed schools, excepting those in the three instructional aid schools, were transferred to public schools, although a few requiring boarding school care were placed in other boarding schools.

The Fort Defiance Boarding School, one of the oldest in the Bureau, established about 1880, was closed in March 1959 because of fire safety hazards in the dormitories. Immediate temporary arrangements were made to reassign students to other schools in order that they should not lose the important last few weeks of the school year.

Plans were also made during the fiscal year to expand the Bureau's school facilities at other locations. At Albuquerque, N. Mex., construction was started on two new dormitories to house 512 students

and to be opened at the beginning of the 1959 fall term. At four localities in Alaska construction was activated on six additional classrooms to provide space for an additional 180 pupils by the same deadline. And at Fort Wingate, N. Mex., a major construction project was launched to increase the school's capacity by about 325 students. This latter project was scheduled for completion some time after the start of the new school term.

Adjustment in Instructional Programs

As compared to earlier years, the present-day Indian students are more similar to their public school contemporaries in sophistication, age-grade placement, academic achievement, desire to complete high school, and financial resources for obtaining higher education.

The table below indicates the average age of high school students in one particular Federal school in 1936, 1958, and in 1959.

Average age by grade

Year	IX	X	XI	XII
1936.....	20.4	19.1	20.0	19.8
1958.....	15.4	16.3	17.1	18.4
1959.....	15.2	16.2	17.3	18.1

To meet the needs of these young people, the Bureau successfully developed with school administrators and, to some extent, with leaders and parents the concept "high school is not enough" if Indians are to compete with other citizens in professional, technological, and vocational fields.

Definite steps taken in 1959 to meet the special needs of Indians in Federal schools included: (1) balancing the school curricula to provide a solid academic program for those going on to college and a high-school program with 2 years of exploratory vocational courses for those who want advanced training in technical or vocational fields; (2) emphasizing language skills and improving reading programs at all grade levels and in the content courses; and (3) strengthening the dormitory programs by closely coordinating them with other school programs to make the dormitories major laboratories for educational, social and cultural growth.

Reservation Adult Education Program

Reservation adult education units served 80 communities under the jurisdiction of 24 agencies or area field offices in 1959. The program

was continued at approximately the 1958 level although there were many requests for additional projects. The appropriation for reservation adult education projects was \$200,000 in 1958 and 1959. In 1960, the amount is doubled which will permit considerable expansion of the program.

The objective of these programs is to raise the general educational level of adult Indians particularly in the subject matter where they feel a need for more training. Reading, writing, oral English, and basic arithmetic are given careful attention in the groups without previous schooling. Intermediate school subjects and special courses are given those with at least 5 years of schooling. Certificates equivalent to high school diplomas are awarded. In groups with relatively high educational attainment and interest in civic affairs, community problems are studied with a view to promoting an awareness of civic responsibility. These discussions include community sanitation, recreation, juvenile delinquency, and participation in civic functions.

Scholarship Program

More than 500 Indian students were assisted in obtaining an education beyond the high-school level in fiscal year 1959 by Federal grant funds in the amount of \$145,000 as compared to 484 students in 1958 who received approximately \$132,000. The appropriation for 1960 is \$250,000 which will assist capable young people who would otherwise forego advanced education. The Shoshone Tribe of Wyoming established a scholarship grant program in 1958. The Arapaho Tribe of Wyoming established a similar program in 1959. Some 25 tribes provide funds for scholarships for their members. In 1959, approximately \$500,000 was designated for this purpose.

Welfare

There was an overall increase in Indian welfare needs during fiscal 1959, both for financial assistance to needy persons and for other social services. The Bureau of Indian Affairs continued its emphasis, within the limits of available resources, on providing services to assist Indians in dealing with their personal problems and managing their own affairs as well as on providing financial assistance for the needy. Child welfare services were made available for dependent, neglected, and handicapped children when such services were not available through other public agencies.



An adult education class in the 49th State—at Kwigillingok, Alaska.

General Assistance

The need for general assistance increased considerably during the year. This is attributed in large part to a continuing decline in employment opportunities for unskilled labor and to increased living costs which resulted in higher assistance grants. The number of Indians who received general assistance was approximately 20 percent higher in fiscal 1959 than in fiscal 1958, and the expenditure for such assistance was approximately 23 percent higher. The increase occurred chiefly in the Aberdeen and Muskogee Areas and on the Cherokee Reservation in North Carolina (where there was an assistance program for only part of fiscal year 1958). It was necessary also to supplement the tribal assistance program on the Red Lake Reservation in Minnesota with Federal funds during fiscal 1959 because of exhaustion of the tribal welfare funds.

In several other areas there was comparatively little change, and in two areas there was a decrease in both caseload and assistance expenditures. The number of Indians receiving general assistance in fiscal 1959 ranged in the usual seasonal pattern from a low of 2,433 households comprising 6,185 persons in September 1958 to

a high of 5,052 comprising 16,752 persons in February 1959. The average monthly grant per household was \$68.05 (\$22.91 per person).

Child Welfare

During the year the Bureau completed contract arrangements with the Child Welfare League of America for a 3-year pilot project on a small scale to facilitate the finding of good adoptive homes for homeless Indian infants. This project was developed because of the unmet needs of infants and unmarried mothers reported from reservations and a lack of sufficient adoptive homes in many of the States with a large Indian population.

Under the pilot project, Bureau social workers on selected reservations can refer homeless infants for adoptive placement to qualified adoptive agencies selected by the Child Welfare League. The major purposes of the project are (1) to demonstrate that adoptive homes can be found for homeless Indian children as an alternative to foster care, and so assist unmarried mothers, who heretofore had little choice in deciding what plan was best for their children; and (2) to stimulate the interest of public and private agencies in the problems of Indian children.

The Child Welfare League selected two highly qualified adoptive agencies in New York and Delaware to participate in the project, and several children have already been accepted by these agencies. A desirable byproduct is that, as a result of the project activities, the attention of some State welfare agencies has been focused more than heretofore upon adoptive placements for Indian children.

The long-standing problem of jurisdiction—resulting from the position taken by certain State courts that where State law and order does not extend to a reservation, the State has no legal jurisdiction over Indian children living on the reservation—continues to hinder or prevent the provision of appropriate protective services for dependent, neglected, or delinquent Indian children on such reservations. Cases involving adoption, custody and commitment to appropriate specialized State institutions are affected.

There are, however, some prospects of progress in this confused legal situation. The State Department of Public Welfare in one State is seeking a ruling from the State Supreme Court regarding State court jurisdiction over Indian children. In another State, Bureau and State officials cooperatively have prepared material for a legal test of the jurisdiction of the State's juvenile court over Indian children on a reservation. The Bureau's Branch of Welfare, acting through the Interdepartmental Committee on Children and Youth, has requested consideration of jurisdictional questions affect-

ing Indian children in the 1960 White House Conference on Children and Youth. The 1960 White House Conference staff has suggested consideration of this problem, among others, to its State Committees.

Law and Order

During the fiscal year 1959 no new legislation was enacted by any State pursuant to Public Law 280, 83d Congress, to assume civil and criminal jurisdiction over Indian land in such State. The constitutionality of legislation enacted in 1957 by the State of Washington pursuant to Public Law 280, was challenged in a case that arose on the Tulalip Reservation involving an offense committed by a Tulalip Indian.

The challenge was made on the ground that the State statute violated article 26 of the State constitution because, it was contended, the State constitution had to be amended before the legislature could act pursuant to Public Law 280. The Washington State Supreme Court, recognizing the emergency situation which the lower court ruling created in law enforcement on ten reservations in the State, granted a writ of certiorari, and in a decision handed down on March 26, 1959, in a case entitled *State of Washington v. Paul*, held that the 1957 statute was not unconstitutional.

At the close of the 1958 fiscal year, there was pending before the United States Supreme Court on a writ of certiorari the case entitled *Williams v. Lee* which involved the question of the application of State civil process against an Indian on the Navajo Reservation. The Supreme Court of Arizona had ruled that such process was applicable. The United States Supreme Court, in deciding the Lee Case (358 U.S. 217) during this fiscal year, held that the Arizona courts are not free to exercise jurisdiction over a civil suit by one who is not an Indian against an Indian where the cause of action arose on the reservation. The effects of the Lee decision are not yet known.

By the act of August 8, 1958 (Public Law 85-615; 72 Stat. 545), Public Law 280 was amended to add Alaska to the list of States that have civil and criminal jurisdiction over the Indian country in those States. On the basis of the 1958 statute, the Bureau terminated its law enforcement activities in Alaska as of June 30, 1959.

During the year a rather important interpretation was made with respect to the assumption of jurisdiction by States under Public Law 280. The view was expressed, with the concurrence of the Solicitor of the Department, that a reasonable interpretation of

the statute, in light of its clear purpose to give the States complete control over the timing of the State action, would permit a State to proceed on a "piecemeal" basis in the assumption of jurisdiction. This could be done either geographically or in terms of subject matter (i.e. by the State assuming jurisdiction in certain types of cases). Some tribal attorneys and some Bureau of Indian Affairs field personnel seem to feel that "piecemeal" assumption of jurisdiction on a subject matter basis will enable progress to be made in transfer of jurisdiction although the Solicitor pointed out that this could lead to complexities and difficulties.

Arts and Crafts

The Indian Arts and Crafts Board continues to encourage production and sales organizations owned and operated by Indians.

An excellent example of what can be accomplished through such organizations is provided by the Qualla Arts and Crafts Mutual, Inc., Cherokee, N. C., from the time it was organized in December 1946 to December 31, 1958.

From early times the Cherokee Indians have been noted for their fine basketry, excellent wood products made from the hardwoods of their mountains, and articles woven from wool as well as from corn shucks and cane cuttings. Dolls were among their production as well as a variety of beadwork.

The teachers in the Cherokee schools encouraged this work. Emphasis was placed on high standards of craftsmanship and encouragement was given in the use of their traditional designs. Further interest was stimulated when large numbers of tourists began visiting the Great Smoky Mountains. The public was interested in not only seeing but buying these beautiful and useful handicrafts.

Traders in the village of Cherokee, quick to see good business in Indian crafts, began to buy and offer them for resale to the tourist trade. Unfortunately, this trader market gave the craftsmen little opportunity to set their own prices for their products. The common practice was for the Indian craftsman to offer his wares to the trader who in turn would quote his giving price on an established "take it or leave it" basis.

Cherokee craftsmen organize

Encouraged by the Cherokee Indian Agency officials and assisted by the Indian Arts and Crafts Board, the Cherokee craftsmen

formally organized in December 1946 so that through coordinated efforts they might better their production, establish fairer prices and find a wider market for their products. The organization is now self-sufficient. It has its own officers, its board of directors, its committees on standards, membership qualifications, and sales. It has no outstanding debts and sales are growing. Of most importance is the prospect this coming year for the completion of a new \$50,000 sales center building on the highway.

The proof of this successful venture may be found in the answer to these questions: Of what value is the co-op on the reservation? Who gets the money?



A Cherokee father-daughter team demonstrate the making of beautiful and useful salad bowls at their Craftsman's Fair.

1. Crafts bought from producing members over the last 13 years amounted to -----	\$241,697.24
2. Dividends paid to producing members on the basis of their sales to the co-op over the 13 years -----	8,399.53
3. Salaries paid to its employees by the co-op since the highway shop was put into operation 10 years ago -----	26,779.01
4. Rent paid to the Tribal Council for sales-room space for 10 years -----	10,865.61
5. Reservation levy or business tax paid to the Tribal Council over the past 7 years -----	5,376.78
6. Equity paid in full to membership for 1946 -----	1,156.23
7. Equity paid in full for deceased members -----	1,172.21
Total cash paid by co-op to individual Cherokee craftsmen and to Tribal Council -----	295,446.66
Present equity or value that the active members now have in their organization is -----	41,561.96

There are 202 members (eight deceased) in the organization. A few members are not presently active producers. Six members have full-time jobs as craftsmen. The others use crafts as a supplementary income and many members depend almost entirely on the sale of their crafts for the family food during the fall and winter months.

The sale of Cherokee crafts through the cooperative has shown a steady gain, starting in 1946 with \$7,000 and increasing to \$38,895.09 in 1958. The total sales for the 13-year period amounted to \$350,260.78.

Tribal Programs

The act of August 18, 1958 (72 Stat. 619), known as the California Rancheria Act, provides for distribution of the land and assets of 41 of the 116 Indian rancherias and reservations in California. Approximately 1,387 people are in position to benefit by the distribution of 7,617 acres of land at these 41 locations.

Residents of these rancherias by resolution requested this legislation. In most cases they also requested that certain actions be taken by the Federal Government before title to the lands passed to them. The legislation provides that a plan shall be prepared for each rancheria by the Indians outlining how and to whom the assets shall be distributed. Such a plan, when approved by the Secretary of The Interior and accepted by the participants, becomes the operating program under which title is transferred from the Federal Government to the Indians.

Under the law the Department of the Interior, thru its Bureau of Indian Affairs, is required to (1) assist the Indians in the preparation of the plan, (2) help in the organization of legal entities if the Indians decide to hold property in common, (3) have ex-

terior and interior surveys made of the rancheria lands, (4) complete road construction or improvements, (5) install and rehabilitate water systems, (6) cancel reimbursable indebtedness against the lands, (7) arrange land exchanges, (8) convey Federally owned property, (9) distribute funds held in trust, (10) protect the rights of minors or persons non compos mentis, (11) undertake a special educational training program for the Indians involved, and (12) issue conveyancing instruments. When the plans have been completed, approved, and accepted, the Indians participating will no longer be entitled, as Indians, to special Federal services.

Authority to administer the act was delegated to the Commissioner of Indian Affairs and in turn to the Area Director at Sacramento. The Secretary of the Interior retained authority to review appeals if there were any objections to a plan filed, and to publish regulations and proclamations in the Federal Register. The Commissioner retained authority to approve the plans, cancel reimbursable indebtednesses and to revoke constitutions and charters. Regulations were published on June 9, 1959, as section 242.1 through section 242.10 of chapter I, sub-chapter V—Termination of Federal Indian Relationships, of the Code of Federal Regulations.

In the first year of the law's operation 23 of the 41 rancherias submitted plans which were tentatively approved. Each plan is posted on the lands of the rancheria for 30 days during which time objections may be filed. If no objections are received, the plan is given final approval and, when accepted by a referendum vote of the participants, is carried out. If objections are received, the Secretary of the Interior may revise the plan before giving final approval. Plans for the other 18 rancherias are expected to be filed during fiscal 1960, and the provisions of all the plans carried out on or before the end of the calendar year 1962.

Klamath Indians of Oregon

In January 1958, the Secretary of the Interior by executive communication asked the Congress to protect the conservation management of the Klamath Indian forest, which was subject to disposal pursuant to the act of August 13, 1954 (68 Stat. 718), as amended, terminating Federal trusteeship of the Tribe. The Congress immediately took this under consideration and further amended the Klamath Act by passing the act of August 23, 1958 (72 Stat. 816).

Primarily this amendment required that the 1957 appraisal of the tribal assets be reviewed and that boundaries be established for the forest lands requiring sustained-yield management. The amendment also provided that the designated forest lands would first be

offered to private purchasers subject to a covenant for sustained-yield management. If not so purchased, they would be acquired by the United States Government (subject to an overall maximum of \$90,000,000) and added to the national forest system. In addition, title to the marsh lands would be taken in the name of the United States Government and designated as the Klamath Forest National Wildlife Refuge. Lands lying outside the forest and marsh boundaries (fringe units), selected to be sold for the benefit of withdrawing members, would be sold without the sustained-yield covenant.

The 1958 amendment also postponed the date for completing the termination procedures for an additional year to August 13, 1961.

Practically all of the so-called fringe units have now been sold, mostly to tribal members. Four sustained-yield units were advertised for sale on April 20, 1959, with opening of the bids scheduled for January 20, 1960. Three more units were advertised July 1, 1959, and the remaining four units will be advertised November 1, 1959.

Special Loan Program Arranged

Because of the delay in the sales of the properties, extended by the last amendment, a special loan program was arranged for the Klamaths. By the act of June 11, 1959 (73 Stat. 70), legislative authority was obtained to make loans without interest to Klamath withdrawing members regardless of their degree of Indian blood.

On March 3, 1959, the trust for the management of the remaining group's properties was executed. Forest and other lands totaling 144,485.55 acres and funds in excess of \$749,000.00 were transferred to the United States National Bank of Portland, the designated trustee.

The act of August 23, 1958, ended the services of the Management Specialists, and their functions were assumed by the Bureau of Indian Affairs. In compliance with section 15 of the basic act, as amended, requiring protective measures for minors and others in need of assistance in conducting their affairs, over 200 guardianships and conservatorships and 911 trusts were established.

Menominee

The act of June 17, 1954 (68 Stat. 250), as amended, required that the Menominee Tribe of Wisconsin prepare and submit to the Secretary of the Interior by February 1, 1959, a plan for taking over its property and affairs in an unrestricted status. The Secretary is directed to accept the plan as a basis for lifting the special

Federal trusteeship and conveying the property if he finds that it treats the tribal membership with reasonable equity and conforms to applicable Federal and State law. The plan can be implemented any time up to, but not later than, December 31, 1960, when the Secretary of the Interior must have proclaimed the termination of the Federal trusteeship.

On January 26, 1959, the Menominee Tribe conditionally submitted a plan comprising articles of incorporation and bylaws for the organization of its commercial property, a voting trust for the supervision of its corporation, an income bond indenture, a bulk trust proposal for the administration of the interests of minors and incompetents; and a many-faceted package of proposed legislation that was concurrently submitted to the Wisconsin State Legislature to provide for the creation of a new Menominee County embracing the reservation area, a merger of the existing 10 townships into 1 township contiguous with the proposed county, a special system of taxation and sustained-yield timber management regulation by the State, a merger of school districts and court jurisdictions with neighboring counties, and numerous other detailed provisions.

The Department of the Interior responded to the Tribe's proposal on April 30, 1959, after affording the Tribe all the time permissible under the statute to remove its conditions and make the plan available for action in an approvable form. It was pointed out that approval was made difficult by the proviso that "the Tribe's approval of such plan is conditioned on acceptance by the Wisconsin Legislature of the legislative proposals substantially as submitted," that its conformity to State law was contingent on proposed statutes not yet enacted (yet which would be integral components for the plan's functioning), and that a vital part (the corporation's bond indenture) was provided for but not then drafted.

The Department held that the plan was not approvable *per se*, but accepted it as structurally feasible and approvable in principle once its contingencies were removed. The Tribe's plan was then adopted conditionally by the Secretary of the Interior as his plan for the allowable statutory period of 3 months in order to work out its contingencies. By the close of the fiscal year the Tribe's proposal had undergone extensive compromising and adjustment before the State Legislative Council and the Legislature, and August 1 became the deadline by which the plan would have to be refined to the mutual satisfaction of the Tribe and the Secretary.¹

¹ After this reporting period the Governor of Wisconsin did sign the Menominee proposals into law but it was on July 30, only 2 days before the August 1 deadline. The Secretary of the Interior responded on July 31, that he was approving the Tribe's plan "in principle" but that a period after August 1 would have to be allowed by the Tribe for the Department to analyze the plan thoroughly for its conformity to law and its equity. The Tribe agreed to any changes consistent with the principles of the plan, such changes to be retroactive to August 1.

Wyandotte Tribe of Oklahoma

The act of August 1, 1956 (70 Stat. 893), provided for termination of Federal trusteeship of the Wyandotte Tribe of Oklahoma on or before August 1, 1959. After settlement of 250 appeals, a final roll of the tribal membership was approved by the Secretary on January 29, 1959. This roll, containing 1,157 names, was published in the Federal Register on February 25, 1959.

The major remaining item in carrying out provisions of the act was disposition of the Tribe's Huron Cemetery, located in the heart of downtown Kansas City, Kans. A preliminary survey of the cemetery, conducted by the Department's Bureau of Land Management in February, revealed several encroachments on the property. An appraisal report received in May estimated the value of the site, with all graves removed, at \$291,000.

In June, the House Indian Affairs Subcommittee held a hearing in Kansas City on bills to make the cemetery a national monument but recommended no change in the 1956 act. A tribal referendum conducted in June revealed an overwhelming desire on the part of the members to sell the cemetery and distribute the net proceeds left after relocation of the graves. The members were told at the time that the pro rata distributions would probably not exceed \$130. At the completion of the hearings, the Muskogee Area Director moved to advertise the property.

Peoria and Ottawa Tribes of Oklahoma

In accordance with another termination act, that of August 2, 1956 (70 Stat. 937), the Bureau of Indian Affairs, through its Branch of Tribal Programs, completed the final roll of the Peoria Tribe of Oklahoma, consisting of 640 names. This was approved by the Secretary on April 15, 1959, and was published in the Federal Register on April 30, 1959. Pursuant to a third act of this kind, that of August 3, 1956 (70 Stat. 963), a final roll, consisting of 630 names of the Ottawa Tribe of Oklahoma was awaiting the Secretary's approval at the end of the fiscal year.

Tribal Government

To strengthen democratic procedures and improve administrative practices of the tribal organizations, the Bureau, in fiscal 1959, obtained final approval from the Secretary in some 50 instances of new tribal constitutions or amendments to tribal constitutions. In numerous cases the Bureau has worked closely with Indian groups and assisted them in devising special organizational docu-



Through mobile school units, the Bureau of Indian Affairs is bringing educational advantages even to the most remote regions of the huge Navajo Reservation.

ments or procedures which would facilitate the handling of their affairs.

Navajo-Hopi Rehabilitation

The Long Range Act, passed by Congress in 1950, authorized the appropriation of \$25,000,000 with which to finance the initial phase of a school construction program designed eventually to provide educational opportunities at an elementary- and high-school level for all school age Navajo children. During the period fiscal years 1951-58 inclusive, \$24,527,295 was made available for this purpose, and school enrollment was increased from 13,480 at the close of the 1951-52 school year to 28,043 at the close of the 1957-58 school year.

No specific action has been taken by Congress to increase the amount authorized for education construction purposes by the Long Range Act, but additional appropriated funds were made available in the amount of \$5,195,264 in fiscal 1959. These funds

were allocated for purposes of construction, advanced planning and trailer school relocation, and include money allocated for construction of the Leupp school (\$3,975,000), the Cove Day School (\$460,000), and the Jones Ranch School (\$350,000).

In addition to this Federal school construction, space for approximately 365 Navajo children was provided in public schools completed during fiscal 1959 at Tohatchi, Tse Bonita, Church Rock, and Fort Defiance (the latter is a school expansion project). In addition, five public school facilities with a total capacity of 2,005 Navajo students were in the process of building in 1959 at Fort Defiance, Chinle, Ganado, Tuba City, and Keyenta.

Irrigation Projects

The Long Range Act authorized the appropriation of \$9,000,000 for irrigation construction purposes on the Navajo Reservation. A total of \$4,337,775 was allocated for this purpose to the end of fiscal 1958, and with the addition of \$640,000 in fiscal 1959 the total stood at \$4,881,040. With the 1959 allocation, the following construction work was carried out.

1. *The Hogback project.*—A segment of main canal 2.7 miles in length, with 7 lateral turnouts, and 3.9 miles of laterals with 117 concrete drops were built under contract, and 817 acres of land was subjugated. The newly developed farmland will be divided into 7 units which will be assigned to Navajos recently graduated from the Navajo Tribal Farm Training School at Shiprock, N. Mex. Total cost of this work was \$296,575.

2. *The Fruitland project.*—A total of \$45,000 was used for the replacement of old timber drops on this project.

3. *Construction Warehouse.*—With expiration of a lease on facilities owned by the Santa Fe Railroad and utilized by the Bureau of Indian Affairs for warehouse purposes, it became necessary to move the irrigation warehouse and shop to Shiprock, N. Mex.

Roads and Trails

The Long Range Act authorized appropriation of \$20,000,000 for necessary road and trail construction on the Navajo-Hopi Reservations, of which \$13,870,180 had been allocated by the end of fiscal year 1958. In 1959, with the allocation of an additional \$2,196,108 the total was brought to \$16,066,288.

Public Law 85-740 enacted in 1958 amended the Long Range Act authorizing the appropriation of an additional \$20,000,000 for the construction and improvement of Routes 1 and 3. Contract

authorizations to a total of \$1,980,000 were allocated for fiscal 1959, including the following projects:

1. Construction of the final segment of pavement on Route 3, involving 28.7 miles between Dinnebito Wash and Coal Mine Mesa.

2. The widening and placing of a plant mix on a segment of road extending 9.7 miles westward from the Arizona-New Mexico State line on Route 3.

Conservation and Range Improvement

The Long Range Act authorized the appropriation of \$10,000,000 for soil and moisture conservation programs on the Navajo-Hopi Reservations, of which \$4,646,625 had been allocated through fiscal 1958. With an allocation of \$570,617 in fiscal 1959, the total stands at \$5,217,242 since the inception of the 10-year program.

In conjunction with other funds (Federal and tribal) the 1959 allocation was used to carry out soil and moisture conservation work included under the 20-year development program. During the year, 128 land use plans were developed, 21,907 acres of undesirable brush was removed from reservation rangelands, 89 flood control dams and 69 storage dams were built and 1,152 educational meetings were held with Navajo communities.

Revolving Loan Fund

The Long Range Act authorized the application of \$5,000,000 to provide necessary credit to Navajo and Hopi Indians for the development of productive enterprises. During the period 1952-53, the Navajo Tribe borrowed \$700,000 from the Federal Government under this authorization, to which the Tribe added \$44,000 of tribal funds. A total of \$898,629.77 has been loaned to 976 borrowers, of which \$499,759.20 has been repaid since the inception of the program. During the past fiscal year, \$106,929.92 was loaned to 77 borrowers, and \$153,052.95 was received in loan repayments. There are currently 270 active loan cases.

Employment Assistance

In the field of employment assistance, the Bureau of Indian Affairs now provides the following types of opportunities for Indian people who qualify: (1) relocation for employment, (2) adult vocational training in non-Federal schools, (3) on-the-job

training in industrial plants, and (4) job placement within the State of reservation residence.

The newest of these services is the last one mentioned. It was initiated in fiscal 1959 in the States of Montana, Wisconsin, and South Dakota where an experienced placement officer of the Bureau was assigned to work with the three State employment services. Indians on Montana reservations were helped to find jobs in Montana and a similar plan was followed in the other two States. During the first year jobs were located for 175 Indian workers in the three States and assistance in moving was provided to 350 people including family dependents.

Relocation Services

Because the market for unskilled and semi-skilled workers was quite limited in most "relocation cities" until the spring of 1959, the Relocation Services Program of the Bureau was carried forward at a somewhat reduced tempo during the fiscal year. Assistance was provided to 3,560 persons including 1,655 who relocated as family heads or as unattached individuals. The comparable figures for fiscal 1958 were 5,728 and 2,373.

The office at Cincinnati, Ohio, was closed in fiscal 1959 leaving a balance of nine offices operating in destination cities at the end of the period. These were Chicago, Ill.; Denver, Colo.; Los Angeles, Oakland, San Jose, and San Francisco, Calif.; Cleveland, Ohio; Dallas, Tex.; and St. Louis, Mo.

In addition to the job market limitations, another factor accounting for the smaller volume of new relocations during the year was a recognition by the Bureau of the need for providing current relocation applicants with greater service over a longer period in order to assure a successful adjustment. Increased emphasis was placed on the upgrading of relocatees' jobs, the improvement of housing accommodations, training in money management, arousing increased interest in savings accounts, encouraging night school training for adults, and stimulating interest and participation in community activities.

Adult Vocational Training

Interest in adult vocational training increased to such an extent that opportunity to file applications was made available to all



Hundreds of Indians between 18 and 35 are acquiring new skills and improving their earning power through the vocational training program sponsored by the Bureau of Indian Affairs.

areas. More comprehensive training opportunities have been developed. At present, there are 404 courses approved at 147 different institutions. Some of the most popular courses are: auto mechanics, welding, cosmetology, radio and TV repair, stenography, typing, and body repair. Approximately one-half of the applicants accepted and entered in training took vocational courses at institutions within their own States. There was a heavy carryover of trainees (in excess of 900) into fiscal 1960 which will limit the enrollment of new applicants. During the year, 1,547 trainees were enrolled

and assistance in moving was furnished to 3,094 persons including family dependents.

On-the-job Training

Interest in on-the-job training is growing, and this offers a sound opportunity for employment on or near the reservations. Applicants for on-the-job training in industrial plants are screened by the Bureau of Indian Affairs and final selection of the worker is made by the plant management. In addition to the liaison work carried on with the employer, continuous counseling and guidance services are made available to the trainees. New units entered in this field of training consisted of 98 singles or family heads representing 196 persons. At present, there are nine contracts in effect. Additional contracts are in the negotiation stage.

Industrial Development

The purpose of the Industrial Development Program of the Bureau of Indian Affairs is to assist the Indian people in cooperating with their neighboring communities in the development of plans and programs which will attract industry to the reservation areas, and thus provide employment opportunities and improve economic and social conditions.

Fundamentally, two kinds of action are needed to increase industrial payrolls in the general vicinity of reservations: (1) providing information about the advantages that can be offered to firms that might locate in the community; and (2) taking the action necessary to create or improve local conditions which will make the community desirable as a manufacturing location.

To provide impetus in fulfilling these needs, industrial development specialists were assigned to special field offices in Chicago and Los Angeles and to six of the Area Offices. In addition, an industrial development specialist was assigned to work on a pilot project in cooperation with the North Dakota Economic Development Commission at Bismarck, N. Dak.

During fiscal year 1959, continuing progress was made in (a) educating tribal leaders in the basic concepts of industrial development and the need for cooperation with neighboring communities in creating the proper local environment conducive to industrial development and growth; (b) providing assistance to tribal and community groups in organizing and establishing industrial development foundations and similar entities to negotiate with industry;

(c) compiling statistical data and preparing industrial fact sheets and other related descriptive data concerning local industrial plans, resources and assets; and (d) developing prospects for on-the-job training projects which will provide employment prospects for Indian people on or near reservations.

The McNary Townsite in Oregon, surplus Government property made available through the provisions of Public Law 85-186 (August 28, 1957) to the Confederated Tribes of the Umatilla Reservation, Oreg., was leased to a California concern engaged in the manufacture of mobile homes. The official opening of the plant was held on February 25, 1959, and the first mobile home came off the assembly line on May 15, 1959, at a special ceremony. The plant opened with 26 employees and is expected eventually to provide jobs for about 200 workers. Indians are given preference in hiring.

The Eastern Band of Cherokee Indians recently entered into a 25-year lease with a manufacturer of bedding and quilts for 6 acres of land and a 75,000-square-foot building to be constructed on the Cherokee Reservation in North Carolina at a cost of approximately \$300,000. Upon completion of the building, it is expected that about 155 people will be employed, with preference given to members of the Eastern Cherokee Band.

Realty

During fiscal 1959, the following major developments took place:

(1) The moratorium on Indian land sales, which was imposed on May 28, 1958, in compliance with a congressional request was lifted and sales resumed under the Bureau's policy statement of May 12, 1958.

(2) Bureau and Departmental policies clarifying when individual Indians and tribes may acquire additional land in trust status and when they will be required to acquire their additional lands in a fee status were contained in a memorandum to all Area Directors, approved by the Assistant Secretary for Public Land Management on April 22, 1959.

(3) Limited land sale moratoriums were declared on the Standing Rock and Lower Brule Reservations to allow Indians displaced by the Oahe and Fort Randall Reservoir takings to have first opportunity to relocate on reservation lands being offered for sale, and similar moratoriums were put into effect on the Omaha and Winnebago Reservations to allow the tribal councils to prepare more detailed land consolidation programs.



One of the encouraging developments of the year was the establishment of a plant for the manufacture of mobile homes near the Umatilla Reservation in Oregon on land formerly used as the McNary Dam Townsite. Most of the employees are Indians.

(4) Allotting was completed on the Torres-Martinez Reservation in California.

(5) Instructions for the equalization of allotments on the Palm Springs Reservation were approved and the preliminary work on supplemental allotments was in progress at the close of the fiscal year.

(6) A new section was added to the regulations, 25 CFR 121.2a, to assure, insofar as practicable, that Indian applicants for patents-in-fee are informed concerning the disposition of their applications before such information is made available to the general public.

During the year, the Bureau of Indian Affairs processed a total

of 10,976 realty transactions involving acquisitions and disposals, including 2,138 probate inventories. In total 547,763.39 acres of trust or restricted land were sold by their Indian owners. Of this acreage, 97,468.62 acres were acquired either by individual Indians or by tribes. Land sales on the Klamath Reservation in connection with the termination program accounted for 208,463.75 acres. In addition, 23,886.84 acres of fee or non-Indian owned lands were purchased and brought into either tribal or individual Indian ownership. Sales to unrestricted status at the request of Indian owners accounted for 1,335 approved transactions; issuance of patents in fee to Indian owners, removals of restrictions and certificates of competency for 780; exchanges and partitions for 531; purchases for 659; and other miscellaneous transactions for 1,005. In addition, 4,528 applications for various transactions were processed which were either disapproved or withdrawn.

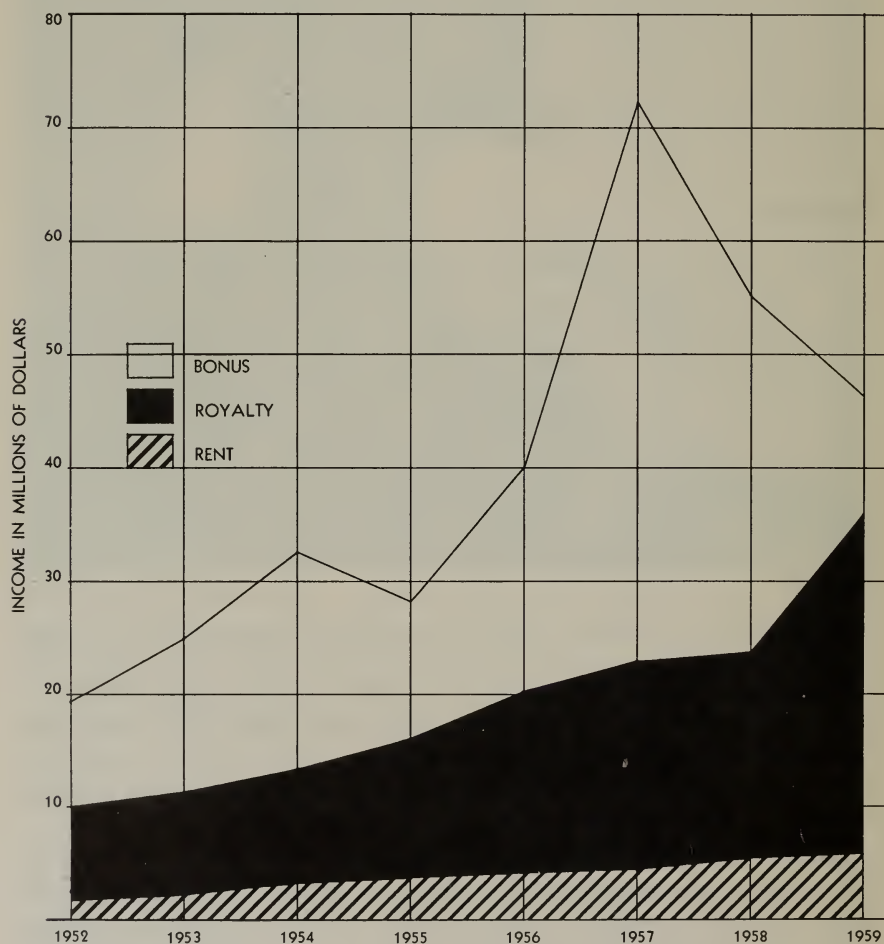
Minerals

There was a reduced demand for new oil and gas leases in fiscal 1959. On the Navajo Reservations, for example, only 109,323 acres were leased as compared with 382,373 acres for 1958. The bonus for Navajo leases for 1959 amounted to \$3,939,512, a decrease of \$23,756,887 from the prior year. Of interest was the Navajo lease sale held January 13, 1959, at which a bonus of \$5,505 per acre was paid for a 160-acre tract.

Although there was some reduction in the leasing of Navajo lands, the number of producing wells drilled on these lands increased from 366 to 771, and the royalty received by Indian owners increased from \$757,846 for the prior year to \$10,496,820. The success ratio of the wildcat wells is regarded as above the national average for the year. Two new pipelines in operation for about a year encouraged the drilling of additional wells in the Aneth (Utah) and Horseshoe Canyon and Bista (New Mexico) areas on the Navajo Reservation. The second producing oil well in the State of Arizona was completed during the year on Navajo tribal land. The first oil well was drilled on Navajo tribal land in 1955.

The total income from bonuses, rentals and royalties on oil and gas leases and prospecting permits in fiscal 1959 amounted to \$46,587,458. In bonus income there was a reduction of almost \$21,000,000 as compared with fiscal 1958. The total rental increased about \$541,000. The royalty income, however, increased by more than 60 percent, advancing from \$18,453,532 in 1958 to \$30,172,382 for 1959.

In the exploration of minerals other than oil and gas, there has been little new development except the issuance of a preferential coal prospecting permit on approximately 85,760 acres of Navajo tribal lands in New Mexico. The permit provides for the selection of acreage for lease. It is contemplated that coal will be processed for two major purposes. One of these involves the production of gas to be mixed with natural gas carried in the lessee's pipelines which already cross the area; the other involves production of liquid hydrocarbon compounds of motor fuels and additional expected byproducts.



INCOME FROM OIL AND GAS OPERATIONS ON INDIAN LAND FOR FISCAL YEARS 1952-59

A total of 5,285,679 acres was under oil and gas lease at the end of fiscal year 1959, covered by 18,858 individual lease contracts

As the result of restrictions in the purchasing policy of the Atomic Energy Commission, there has been a marked decline in the acquiring of new uranium leases, and authority to shut down operations has been granted on a number of the existing leases. However, leases on 3,041.36 acres of allotted Navajo lands in McKinley County, N. Mex., were recently sold for a bonus of \$19,315.60. While the number of producing uranium leases on Indian lands has declined, there has been very little reduction in the tonnage mined as compared to the prior year. The royalty from the Jackpile uranium mine involving lands of the Laguna Pueblo, N. Mex., amounted to \$1,742,877 for this period.

Due to the poor market for lead and zinc, it has been necessary to grant shutdown permits on the marginal lead and zinc leases covering Quapaw Indian lands in Oklahoma.

The total income to Indian tribes and individuals from minerals other than oil and gas during fiscal year 1959 amounted to \$3,030,004.

At the close of the fiscal year, there were 19,804 subsurface leases of all kinds in force and effect covering 5,459,040 acres of Indian-owned lands.

Records

During fiscal 1959, exploratory studies looking toward development of a modern and improved land records and title system were conducted on a continuing basis. The proposed system, patterned primarily on the Torrens method of recording land title transactions, includes the use of modern electronic data processing equipment in sorting and chronologically listing the great mass of title data affecting Indian lands.

A pilot test of the proposed system covering the Lower Brule Reservation in South Dakota will be installed in the Aberdeen Area Office early in fiscal 1960. The electronically listed title data, assembled from Central Office source title documents, will be audited against existing field records, and the system will be placed on an operating basis for this one reservation as a test of its practicability and overall adoption by the Bureau.

Tenure and Management

In fiscal 1959 the Bureau of Indian Affairs processed 2,120 cases granting rights-of-way over Indian lands for various purposes. Present statutory authority vests the power to grant rights-of-way over or across Indian lands in the Secretary of the Interior. With some exceptions, specifically mentioned by the statute, the grant

of right-of-way may be made only with the approval of the Indian owners. The authority of the Secretary to grant rights-of-way, when such grants are in accordance with the prescribed regulations, has been delegated to the operative field level.

At the close of the year there were 34,155 surface leases or permits of all kinds in force on Indian lands, covering 4,534,621 acres and providing an annual rental of \$9,444,065 for the Indian owners. These leases and permits cover the use of Indian lands for farm, farm-pasture, grazing, and business purposes. They do not include lands incorporated in range units.

Long-term leases, authorized under the act of August 9, 1955, have been made on several reservations. Because the act of June 28, 1934 (48 Stat. 984) limits leases for 10 years when made by chartered tribes under the authority of their approved charters, there was considerable confusion over the effect of this statutory limitation after enactment of the 1955 statute. Solicitor's Opinion M-36515 of November 20, 1958, relating to the separability of the chartered and the constitutional bodies of tribal government, served to clarify this situation by indicating that the 1934 act limitation applies only to tribal lands which have been formally transferred to the charter organization. Where the tribal constitution similarly restricts the duration of leases on tribal lands, the tribes desiring to enter into long-term leases will need to adopt appropriate amendments. Many tribes have already so amended their organic documents.

Forestry

Three important actions were taken in fiscal 1959 to improve the administration of Indian forests.

The most important was an amended delegation of authority approved by the Secretary of the Interior on November 20, 1958. It increased the authority previously delegated to the Commissioner of Indian Affairs, so he may now exercise the authority of the Secretary in relation to "all those matters set forth in 25 CFR Chapter I, Subchapter M—Forestry," and also "the adjustment of stumpage rates and the performing of all other administrative actions to be taken by the Secretary pursuant to timber sale contracts now in effect."

The administration of Indian forests, particularly the sale of timber, is simplified by this increased delegation of authority. Equally important, a meaningful appeals procedure is now possible. Under the limited delegation of authority previously in effect, many actions under timber sale contracts were taken at the Secre-

tarial level. There was no higher authority within the Executive Branch of the Government to which an appeal could be taken. Action is now taken by the Commissioner of Indian Affairs, or at subordinate levels. The Secretary is thus in a position to consider appeals from the Commissioner's decisions.

The second important action of the year was a complete revision of 25 CFR 141—The General Forest Regulations. The revised regulations were published in the Federal Register, as a proposed rule making. Following this publication, some minor changes were made. At the close of fiscal 1959 the Regulations, in final form, were being reviewed at the Secretarial level for approval. This is the first overall revision of the Regulations in nearly 25 years.

The third action was approval of standard forms of timber sale contract and a set of standard contract provisions. The approved forms of contract heretofore available could be used only in the sale of timber on trust allotments, and in small volume sale of tribal timber. For each separate large-volume sale it was necessary for the Commissioner or the Secretary to approve a special form of contract. There are now available approved forms of contract for both large

At many reservations, such as Colville in Washington, timber sales are the principal source of tribal income.



and small sales. The standard contract provisions replace the general timber sale regulations that were originally approved in 1920.

With the approval of these forms, the sale of timber is greatly simplified. Area Directors can now advertise timber sales and execute the contracts without first obtaining clearance from the Central Office, except that the Commissioner still approves sales covering estimated volumes exceeding 15 million board feet. However, a great majority of the sales are for less than this amount.

Timber Sales

The general improvement in business conditions, which began in the latter part of 1958, resulted in a modest increase in volume and value of timber sold from Indian lands. The volume of timber cut under contract increased from 425 million board feet in Fiscal year 1958 to 530 million feet in 1959. Cash receipts from these sales increased from \$8¼ million to \$10 million. Sales of timber on Klamath Indian Reservations are not included in the foregoing figures, because sales at that reservation were affected by the termination legislation.

A deduction, not exceeding 10 percent, is made from timber sale receipts to cover, in whole or in part, the cost of forest management and timber sale administration. After such deductions, net income to the Indians from sales of their timber in fiscal 1959 was something more than \$9.1 million. About 72 percent of receipts (exclusive of Klamath) was from the sale of tribally owned timber. The remaining 28 percent was from sales of timber on trust allotments owned by individual Indians.

At many reservations, timber sales are the principal source of tribal income. Among such tribes are those of the Colville and Yakima Reservation in Washington, the Warm Springs in Oregon, the Hoopa Valley in California, the Flathead in Montana, the Mescalero in New Mexico, the Menominee in Wisconsin, and the Fort Apache in Arizona. Without an income from their tribal forests, it would be impossible for these tribes to finance their present activities.

Timber Inventories

Continuing progress was achieved during the year in obtaining timber inventories for forested reservations, and in revising timber sales schedules pursuant to information developed from them. The inventories have generally justified an increase in the annual cut.

By the end of fiscal 1960, acceptable inventories should be available for most of the commercially important Indian forests on reservations under the Gallup, Muskogee, Phoenix, Portland, and Sacramento Area Offices. Major exceptions in these areas will be the lack of adequate inventories for the Mescalero Reservation in New Mexico, the Hualapai Reservation in Arizona, and the Quinault and Makah Reservation in Washington. An inventory has been started on the Quinault Reservation but may take as long as 2 years for completion.



In 1959 the Bureau of Indian Affairs continued its important timber inventory work on forested reservations.

Irrigation

During the 1958 crop year, 572,944 acres of Indian lands were irrigated. The gross production from this acreage was valued at \$56,305,434.

The construction and rehabilitation program, in addition to the annual maintenance program, continued with resulting improved efficiency in water use and better use of the Indians' soil resource. Major accomplishments were as follows:

Irrigation:	<i>New</i>	<i>Rehabilitated or replaced</i>
Irrigable acreage	2, 470	4, 551
Canals and laterals (mi.)	74	487
Structures	1, 145	1, 650
Wells and pumping plants	40	19
Lining-canals and laterals (mi.)	5	17
Drain ditch (mi.)	24	60
Tile drains (linear ft.)	45, 000	-----
Power:		
Customers	444	-----
Transmission lines (mi.)	13	17
Distribution lines (mi.)	41	24
Transformers	334	166

Among the major programs now under way are the rehabilitation work on the six Middle Rio Grande Pueblos; continuation of construction of the Navajo Hogback Extension in New Mexico and of the Michaud Unit of the Fort Hall project, Idaho; continuation of the rehabilitation of Duck Valley, Nevada lands; and expansion and improvement of Colorado River drainage and water control facilities.

Range, Wildlife and Recreational Resources

After nearly three decades of range management under Departmental regulations, Indian reservations now have some of the best forage resources to be found in the western States. The progress made in good management is demonstrated by the condition of the 4,800,000 acres of Indian grazing lands in North and South Dakota. It is estimated that 90 percent of these range lands are in good to excellent condition. The information furnished by range and soil surveys is making it possible to establish better grazing practices through educational work with the range users and through effective location of range improvements.

In the Southwest drought and insufficient range resources to meet the needs of the Indians still present a serious management problem. This is especially true on the Navajo Reservation and on most of the New Mexico Pueblos. Encouraging progress is, however, being

made on a number of other southwestern reservations through the enactment of tribal ordinances and because the Indians are becoming increasingly aware of the economic value of conserving their range.

More than 80 percent of the Indian range is used by Indian livestock operators. On reservations where there is range temporarily in excess of the need of Indian livestock, the units are advertised for competitive bidding. The prices received for grazing privileges sold through competitive bidding are often the highest received within a particular State.

Use of the Indian range resources for 1958 calendar year is as follows:

TABLE 1.—*Use of range in units, 1958*

	Acres (thousands)	Percent of acreage used	Livestock grazed (thousands)	Use value
Total range.....	41, 319			
Total use.....	40, 561	100	822	\$5, 422, 000
Non-Indian use.....	7, 010	17	348	1, 780, 000
Indian use.....	33, 551	81	474	3, 642, 000
Not used.....	758	2		

In addition to the range resource, practically all Indian groups have their wildlife and recreation resources. The Indians are becoming constantly more aware of these resources and are making plans for their better and wiser use. Table 2 indicates the values of these resources at the present time.

TABLE 2.—*Fish and Wildlife—Approximate Income or Value of 1958 Harvest*

Total all reservations	\$3,254,000
Commercial fish	413,000
Domestic fish	607,000
Fur bearing animals	165,000
Game birds	354,000
Big game	1,572,000
Receipt from permits (fishing and hunting)	143,000

Progress made in soil and range inventories during 1959 is of special interest. The Bureau of Indian Affairs started making soil and range surveys in the early 1940's. This work, in the beginning, was on a very limited scale but did furnish needed information for land use and management planning of individual tracts of land. It was primarily a program of straight survey work. As the program progressed, it was broadened to include the interpretation of the collected information. Based on the experience gained in this early work, the program was reorganized in 1957 and emphasis

placed on greater use and understanding of the work by its users and on completing the soil and range inventories of each reservation by a target date of 1965.

During 1959, the Bureau had coordinated soil and range inventory crews working on five Indian reservations. These crews mapped more than 3½ million acres during the year, representing approximately a 2-million acre increase as compared to 1958.

The year 1959 marked the completion by the Bureau of the first coordinated soil and range inventory. This inventory was of the Colville Reservation. A complete report has been prepared and furnished to the tribe as a basis for developing plans for use and management of the soil, plant and water resources, and for planning readjustment programs. It is planned that similar reports to the tribal councils will be prepared for each of the other reservations as the inventories are completed. These inventories furnish Indian tribal groups, individuals, and technicians with essential information about resources that is needed for planning. However, to make maximum use of the inventories, it is necessary that users understand the meaning of the collected information and how it may be applied. As a part of the soil and moisture conservation program, tribal groups and individuals alike are helped to develop their knowledge of fundamental use and management facts and principles as they apply to resources. The explanation of soil differences and how these differences affect land use and management help the Indian people to understand the fundamental "why" of conservation



Increasing numbers of Indian people are learning the value and the techniques of crop improvement and soil conservation through field demonstrations.

which is necessary to continued progress in the effective management of their resources.

Agricultural Extension

A total of \$984,689 was available for the Bureau of Indian Affairs' extension program in fiscal 1959. Of this amount, \$519,000 was allocated to 15 State extension organizations which provided assistance to Indian families under contracts with the Bureau. The Bureau continued to provide direct services in Arizona, Mississippi, and part of New Mexico.

In recent years the Bureau has placed increasing emphasis on the educational aspects of its extension work. Methods and procedures used by the various State land grant college extension organizations in regular extension work are being followed and adapted to the needs of Indian farm families. The Bureau has maintained a close working relationship with these State extension services as well as with the Federal Extension Service. Increased coordination in program development and execution is evidenced by a greater number of joint educational demonstrations and meetings held by these services.



An Indian learning about the conservation problems of his kind of land.



Like other American youth, Indian youngsters on reservations have their own 4-H clubs. This is a "soil school" group at Pawnee, Okla.

The number of 4-H clubs has increased steadily with fields of activity being broadened to include greater opportunities for Indian youth training and development. In the State of Arizona alone, more than 25 percent of the State's total 4-H club membership consists of Indian boys and girls living on reservations.

Roads

Appropriations for the 1959 Bureau of Indian Affairs' road program were authorized in the Federal-Aid Highway Act of 1956. The act provided contract authorization of \$12,000,000 for reservation roads which includes \$2,600,000 for maintenance and \$9,400,000 for construction.

The \$2,600,000 road maintenance program provided maintenance on 16,950 miles of reservation roads and bridges in 20 States. The work included surface repairs, blading, repairs to drainage, clearing of right-of-way, and snow removal.

The 1959 road construction program consisted of projects totaling \$9,400,000. To accelerate road construction, this program was started during the last quarter of 1958 fiscal year by an advance of \$2,000,000 from the 1959 authorization. The construction work ac-

complished during the year included 326 miles of grading and draining; 351 miles of surfacing; 2,687 feet of bridges; and 606 miles of surveys and plans for future projects.

During the past several years there has been a continual upgrading of construction standards on Bureau roads. This upgrading has been necessary to provide adequate roads to serve the increasing traffic volumes. Reservation road traffic has been changing in both volume and type. Higher standards have been required on many projects due to heavy truck traffic caused by the development of reservation resources.

Under the established Bureau policy of building roads up to an acceptable standard and transferring them to a local governmental unit for maintenance wherever possible, the Bureau's nationwide road system was reduced by 384 miles during the year.

Credit Activities

Continued progress was made in 1958 in helping the Indians and their organizations obtain financing needed to develop and utilize their resources, both physical and human. The major portion of such financing is now furnished by the same institutions that serve other citizens. Loans through the Bureau of Indian Affairs are made to Indians unable to obtain financing through customary credit sources.

The activities of the Indians the past few years probably have been financed more adequately, and more sources of financing are now available to them, than at any time in their history. As an indication of the progress made, the following tabulation shows the increase in the amount of financing received by them at the close of the past 6 years.

	Customary credit channels ¹	Through Bureau	Total
1953.....	\$22, 315, 851	\$22, 717, 974	\$45, 033, 825
1954.....	27, 665, 135	21, 449, 804	49, 114, 939
1955.....	33, 959, 558	27, 149, 696	61, 109, 254
1956.....	55, 725, 811	29, 961, 239	85, 687, 110
1957.....	59, 424, 956	30, 344, 983	89, 769, 939
1958.....	60, 998, 783	30, 557, 150	91, 555, 933

¹ Figures are as of Dec. 31 of preceding calendar year.

Total financing in 1958 has more than doubled that of 1953. About 67 percent was furnished by customary lenders and about 33 percent came from tribal funds and loans through the Bureau.

Financing by Customary Financial Institutions

Primary emphasis in the Bureau's credit program is placed on encouraging and helping Indians and their organizations obtain financing from the same institutions that serve other citizens. Bureau personnel assist Indians in dealing with banks, production credit associations, building and loan associations, insurance companies, Federal and State agencies making loans, and other lenders. The trust status of some Indian-owned property, unfamiliarity of some Indians with procedures and requirements of customary lenders, and other such factors make it necessary to give some Indians special assistance.

Many Indians, however, deal with lenders on the same basis as other citizens. Consequently, complete information is not available on all financing furnished Indians by customary lenders. Available data, however, show that financing from these sources increased slightly more than 173 percent over the past 6 years. During 1958 the financing received from customary lenders increased a little less than 3 percent over 1957.

The act of March 29, 1956 (70 Stat. 62-63) authorized the execution and approval of mortgages and deeds of trust on individually owned trust or restricted land. Indians thus are now able to use their land as security for justified financing. The following shows the loans secured by trust land which were outstanding at the end of the past 3 years.

Calendar year	Number of loans out- standing	Balance out- standing
1956.....	86	\$475,600
1957.....	103	560,600
1958.....	113	579,000

Tribal Funds

Tribes with funds of their own available, are now required to use their own moneys to make loans to their members and to finance tribal enterprises, before applying for loans from the United States. The investments of the tribes in these activities total \$21,893,659 at the close of 1958. This was practically the same as the 1957 amount, \$21,875,815.

Revolving Credit Fund

Loans are made by the United States from this fund to tribes, other Indian organizations, and individual Indians. During 1958,

additional amounts loaned totaled \$2,446,614. The amount loaned exceeded the prior year, 1957, by \$244,241 and was the largest in the past 6 years.

Repayments on loans during 1958 were \$1,946,951 which was \$70,181 less than in 1957. Thus the amount of the loans receivable at the close of 1958 was \$8,369,775, an increase of \$468,922 over 1957.

The amount delinquent increased from slightly less than 9 percent of the unpaid balance at the close of 1957 to slightly over 9 percent in 1958. Of the \$769,701 delinquent, \$110,883 was on loans made by the United States to individual Indians, mainly on loans to Navajo and Hopi colonists at the Colorado River Agency in the Phoenix Area. A total of \$44,386 was on loans made to two cooperatives many years ago, which are uncollectible, but on which authority to charge off the debts is lacking. Tribes accounted for the balance, all but \$34,690 of which was in the Juneau Area.

A reserve of \$1,344,343 has been established for potential losses on outstanding loans of \$8,369,775, or slightly more than 16 percent of the unpaid balance. Nearly 84 percent of this reserve was established because of potential losses on loans made in the Juneau Area.

Problem of Alaska Loans

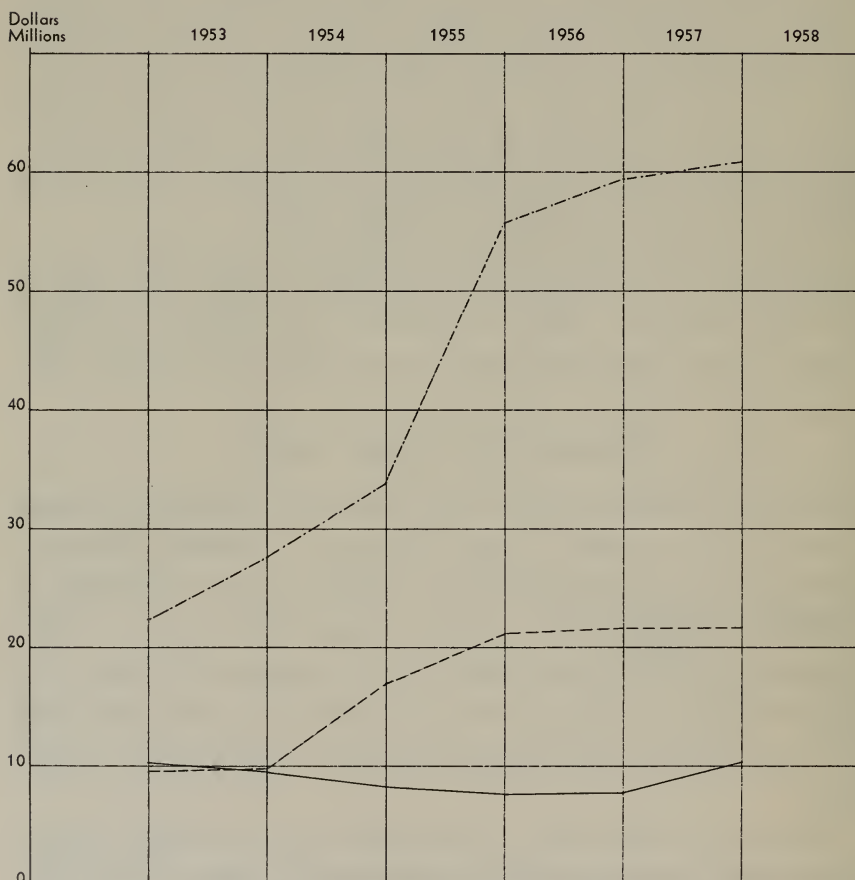
The Bureau is faced with a very critical and perplexing problem on some loans in Alaska. Large losses may be suffered. Four organizations have been declared in default, and are delinquent in payments totaling \$107,202. These, and the loans to four villages for salmon canneries are in critical condition and represent a large potential loss to the United States. The economy of the villages and the welfare of the Natives are vitally affected by credit operations in the Area and every effort is being made to protect and promote both the economy of the Natives and the interest of the United States.

At the close of 1958, there was \$7,314,911 cash in this fund, against which there were outstanding commitments for loans of \$1,430,727. Of the cash balance remaining unobligated, \$1,333,995 was reserved for loans in Oklahoma, exclusive of Osage County, and \$378,587 was reserved for loans to Navajo-Hopi Indians and organizations of these Indians. A balance of \$4,171,602 was available for general credit use.

Since the close of 1958, the demand for loans has greatly increased. Loans to finance the 1959 operations of our Native-owned canneries in Southeastern Alaska total \$973,200. The Bureau is committed to making loans direct by the United States to individual Indians in

SUMMARY OF FINANCING RECEIVED BY INDIANS AND THEIR ORGANIZATIONS

Key: - - - - Customary Credit Channels (non-Bureau)
 ——— Revolving Credit Fund
 - - - - Tribal Funds



six localities including withdrawing members of the Klamath Tribe. A total of \$704,400 was made available for loans to the latter in fiscal year 1959, and it is estimated that over \$1,400,000 will be required in 1960.

Relending

Indian organizations use funds borrowed from the United States to make loans to members and associations of members, and to finance

business enterprises. Tribes use tribal funds for the same purposes. Organizations had cash totaling \$6,126,402 available for continuation of activities at the close of 1958. Amounts outstanding on loans at June 30, 1958, were as follows: Loans to individuals:

Cash -----	\$6,137,893	
Livestock -----	<u>951,138</u>	\$7,089,031
Loans to cooperatives -----		732,093
Financing of enterprises -----		<u>19,027,608</u>
Total -----		26,848,732

Loans to individuals.—The total unpaid balance at the close of 1958 was \$7,089,031 as compared with the balance unpaid June 30, 1957 of \$6,383,510. A total of 1,003 loans of \$2,543,276 was approved during 1958, against 1,068 loans of 2,408,999 in 1957. However, advances of \$318,558 had not been completed at the close of the year. There were 3,107 cash loans outstanding at the year's end. Payments totaling \$1,125,022 were delinquent, and \$534,257 was owing on loans in process of liquidation. Nearly 58 percent of the amount delinquent, and over 29 percent of the amount owing on loans in process of liquidation were in the Juneau area.

Potential losses on outstanding loans of \$6,137,893 were estimated at \$382,514, of which nearly 37 percent was in the Juneau Area. Slightly over 10 percent of the unpaid balance in the Juneau Area was estimated to be uncollectible. The comparable percentage for all other areas was about 5 percent.

The total loans made during 1958 include 93 loans for educational purposes amounting to \$63,227 as compared with 164 loans for \$159,847 in 1957. Every possible effort is being made, by utilization of scholarships, grants, etc., to keep worthy Indian boys and girls in school without placing them in debt. Loans for educational purposes are approved only when other types of assistance have been exhausted.

The total of 189 of the unpaid educational loans with a balance of \$87,634 were owing to the United States, and 486 with a balance of \$341,376 were owing to Indian organizations. About 36 percent of the unpaid balance on loans by the United States and 20 percent of loans by Indian organizations were delinquent.

Loans to cooperatives.—The unpaid balance of \$732,093 is a small increase from the \$715,020 unpaid in 1957. The unpaid balance includes \$44,386 owed to the United States by two cooperative associations in Oklahoma, which is uncollectible. All other loans were current.

Financing of enterprises.—A total of \$19,027,608 was invested in tribal enterprises at the close of 1958. The instructions in the

Bureau's manual were undergoing revision at the close of the fiscal year in an attempt to procure more accurate and uniform reports on financing of enterprises. Generally, enterprises are those tribal business activities that are considered to be at least self-sustaining, or which will produce a net income for the organization and promote its economic development. Activities involving welfare or social aspects of tribal activities are not included.

Budget and Finance

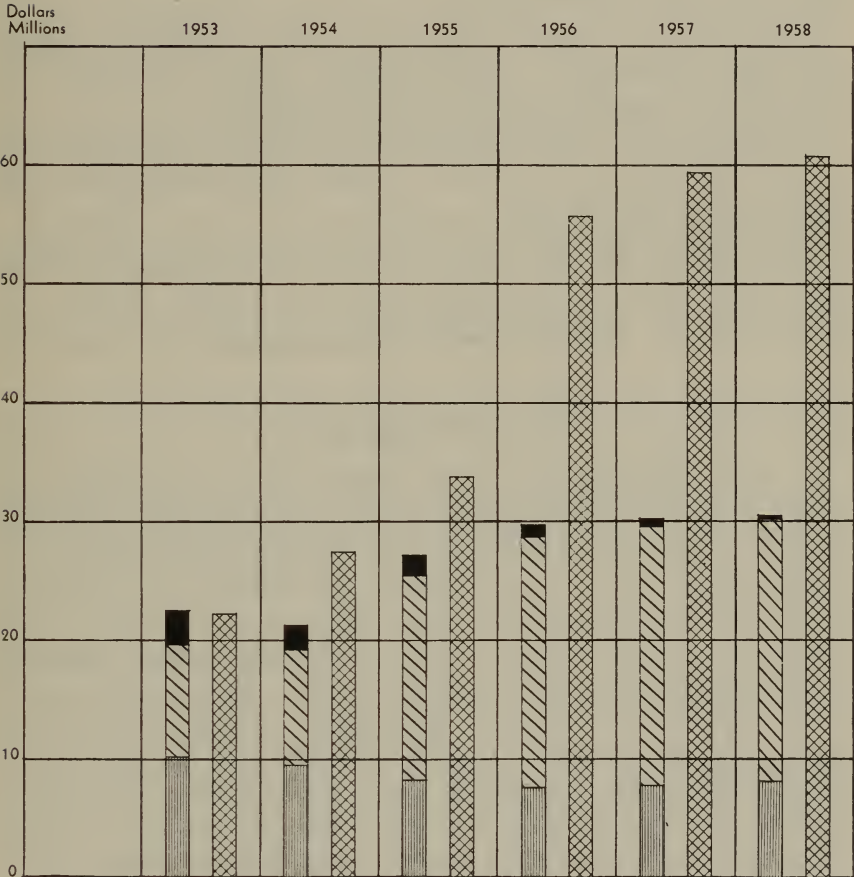
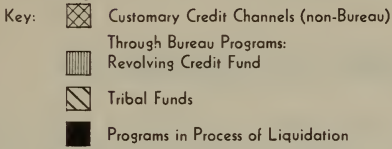
Gross receipts from the management of Indian lands and resources during fiscal year 1959 approximated \$80,247,500. Of this amount \$74,070,000 was deposited in the Treasury of the United States for credit to the account of the various Indian tribes. The principal source of income deposited to the tribal trust accounts was from bonus and royalty payments from oil and gas and mineral leases in the amount of \$54,000,000, and from timber sales in the amount of \$11,500,000. The balance of approximately \$8,500,000 deposited to tribal accounts was from leasing of Indian lands for farming, grazing, and from other miscellaneous sources.

The various Indian tribes used approximately \$65,500,000 of their available funds for the operation of various programs for the benefit of their members. These included the operation of saw mills, tourist accommodations, and farming enterprises; the subjugation of lands; higher-education-tuition grants for Indian students; welfare grants to needy members of their tribes; maintaining law and order and the operation of tribal courts; the general support of tribal governments and the many varied resources management programs operated by the tribes. The balance in trust accounts on July 1, 1959, was approximately \$141,753,768.

Personnel

The Bureauwide supervisory training program for some 2,400 supervisors was continued into its second year with major emphasis on personnel management and administration topics. All training materials used were developed within the Bureau. Participation in Departmental training programs was continued.

The Bureau augmented its promotion program and developed training material on this subject which was presented to all supervisors in the Bureau prior to the inception of the new program on January 1, in accordance with the Civil Service promotion program

COMPARATIVE SUMMARY OF FINANCING RECEIVED BY INDIANS
AND THEIR ORGANIZATIONS

requirements. The basic soundness of the program is confirmed by acceptance on the part of employees and by the favorable remarks of Civil Service Commission inspectors.

Increasing effort was devoted in fiscal 1959 to developing classification and qualification standards with the Department and the Civil Service Commission. Major emphasis was given to standards for approximately 2,400 jobs in the professional education field. Im-

provements in the standards for teachers are expected to raise the caliber of the Bureau's teaching personnel.

Plant Design and Construction

Bureau construction in fiscal 1959 involved five new architectural-engineering contracts for the design of new school facilities and supervision of 42 such contracts awarded in prior years. Fourteen design contracts were completed.

Educational and related facilities providing for 3,337 new pupils were under construction. Classroom space for 914 new pupils was provided by completion of 22 educational projects.

Construction was also in progress on miscellaneous facilities such as jails, fire lookout towers, sanitary facilities, and employee housing, mainly of the portable type.

The Bureau assisted the U.S. Public Health Service in the Indian Health Program by completing 19 construction projects and the supervision of 16 architectural-engineering design contracts for health facilities. Seventeen health facility projects were completed.

Plant Management

In 1959 considerable progress was made under plant management programs to find and eliminate unsanitary and unsafe conditions existing in most of the Bureau's older physical plant facilities. A comprehensive survey was undertaken to determine the corrective measures that are required to make buildings, utilities and service operations safe and sanitary. This survey gave primary emphasis to educational facilities; it included schools, kitchens and dining halls, dormitories, auditoriums, gymnasiums, assembly and recreational buildings in addition to such noneducational facilities as employees' clubs, jails, and utilities and related services. The survey did not include employees' residences, offices, general administrative-type buildings or warehouses, garages and similar structures, or the utilities or services in connection with these facilities. In conducting the survey, consideration was given to reports made by U.S. Public Health Service and State sanitary engineers and by safety engineers, Bureau boiler operation inspectors, Bureau electronic and mechanical engineers, Bureau structural and construction engineers, and Bureau maintenance engineers.

The survey revealed a large number of defects which will require elimination or correction.

Future repair and maintenance and major repairs and improvements programs will give priority to further reducing the tremendous backlog of items requiring correction as reported in this survey.

Property and Supply

In fiscal 1959, the Bureau of Indian Affairs increased its participation in General Services Administration motor pool systems by the transfer of 39 vehicles operated in Montana to the motor pool system at Billings.

The Bureau continued to reduce the size of its land holdings by 10 conveyances, totaling 109.26 acres, to public school districts. Forty-nine Federal buildings located on tribal lands were also conveyed to Indian tribal groups under authority of Public Law 991, 84th Congress (70 Stat. 1057).

Increasing use of the mechanized property accounting system resulted in marked improvement which is reflected in audit reports.

Management Coordination

Only one important organizational adjustment was effected in the Bureau in fiscal 1959. The Osage Agency was transferred from the jurisdiction of the Anadarko Area to the Muskogee Area. The transfer was brought about to expedite administrative housekeeping actions. Such housekeeping functions for both Area Offices are now performed in Muskogee.

Mechanized Procedures

The Bureau continues to move forward in its exploration of applications of punchcard procedures.

Latest experimentation is in connection with realty records, distribution of income from range permits, and per capita payment rolls.

The creation of a Branch of Mechanized Data Processing in the Gallup Area Office was initiated during fiscal 1959, and the top position in the Branch has been filled. Preparations such as the writing of detailed operating procedures, training of project planners, and recruitment of operators are now underway. The goal is to have the branch in partial operation by the end of the first quarter of fiscal 1960.

Reports and Forms Management

During the last three years nearly all Bureau forms currently in active use have been reviewed and revised for greater efficiency. In the last half of this fiscal year, representatives of all Central Office operating and administrative branches attended a series of forms improvement workshops conducted by specialists of the National Archives and the Department of the Interior. The workshops were held to extend to all Central Office staff some knowledge of the analysis and design of forms and the best procedures for their use.

The number and extent of the Bureau's reports remained unchanged since eliminations and reductions were balanced by additional reports required to evaluate new or revised Bureau programs.

Incentive Awards Program

The increase in employee participation in this program which began in fiscal 1956, has continued through fiscal 1959. The number of suggestions submitted in fiscal 1959 (1,195) was more than 11 times the number submitted in fiscal 1956 (108) and almost two and one-half times the number submitted in fiscal 1958 (458). The number of suggestions adopted has increased from 20 in fiscal 1956 to 956 in fiscal 1959.

The incentive awards program was effectively coordinated in 1959 with other management programs of the Bureau. This was accomplished by conducting training sessions on the incentive awards program as part of the Bureau's supervisory training program and by using incentive awards procedures in connection with the hazard elimination contest conducted as part of the Bureau's safety program.

Internal Audit

During 1959 Bureau auditors, working out of two audit field offices (at Albuquerque, N. Mex. and Billings, Mont.), completed audits of 9 of the 10 Bureau areas, all 10 field relocation offices, the Office of Plant Design and Construction (in Albuquerque, N. Mex.) and the Central Office. In addition audit assignments of a special nature involving tribal operations and enterprises, and privately owned concerns carrying on mining activities on tribal Indian land were completed.

Inspection

The Bureau's inspection program has been functioning since March 1955. Its purpose is to promote and encourage high standards of conduct in the management of Indian affairs throughout the Bureau in line with the announced policies of the Department of the Interior. The Inspection Office is primarily responsible for the conduct of "incident type" inspections, general inspection inquiries, and team surveys. During the past year the staff visited a number of field locations and filed 10 reports with the Commissioner concerning various matters of inspection interest.

Bureau of Land Management

Edward Woosley, *Director*



THE CONSERVATION JOB of the Department of the Interior's Bureau of Land Management stretches from the submerged lands off the coast of southern Florida to the permafrost of far-northern Alaska. It deals with fossil fuels being pumped from incredible depths of the earth's crust and the harvesting of forest giants whose topmost branches may rival the height of a 30-story skyscraper.

The conservation job covers the mining and extraction of non-renewable mineral resources and the planting of new seed for the perpetual crop of forests and grasslands. It includes the deliberate destruction of thousands of acres of poisonous rangeland weeds and the care and protection of millions of acres from the destructive forces of fire, insects, and disease. The job involves setting some lands aside for parks and wildlife sanctuaries and making new lands available for new homes and towns and industries.

The conservation job covers more than 477 million acres in 28 States. These lands are the remaining public domain—public lands that are the wealth and heritage of all the people.

The conservation job of the Bureau of Land Management (BLM) is an important contribution to America's resource development. Last year the resource harvest from BLM lands included enough timber to build more than 100,000 average homes. Enough oil to heat more than 5 million homes for the next year. Enough forage to feed more than 11 million livestock and big game for an average of 4 months. And total receipts to the United States Treasury of more than \$136,700,000.

The conservation job which BLM did during the fiscal year ended June 30, 1959, is described in the following pages. In every instance the report reflects the growing importance of these valu-

able publicly owned resources to the future growth and development of the Nation and its people.

Lands and Minerals

The lands and minerals activity of the Bureau of Land Management includes the complex array of classifications and field investigations, adjudication, and a records modernization program, as well as the public service operations of the Bureau's Land Offices. Total BLM appropriations for the lands and minerals activity amounted to \$6,710,400 for fiscal year 1959.

Lands

The approximately 477 million acres of vacant, unreserved, unappropriated public domain lands in the United States are being used to help fill the needs of a growing population and expanding economy.

Last year the Bureau of Land Management issued 12,904 patents (deeds) transferring 763,192 acres to non-Federal ownerships. These included 83,457 acres of agricultural lands, and 15,024 acres of mineral lands, with the balance covering classifications and uses ranging from thousands of sites for summer homes to a land exchange for a giant new industrial plant.

Legislation

Far reaching legislative proposals were enacted or advanced during the year, foreshadowing fundamental changes in the public land situation in the near future. Foremost was the admission of Alaska into the Union (Public Law 85-508, July 7, 1958) with land grants to the new State totaling 103,350,000 acres. The size of the area, coupled with the fact that the State will have the right to choose from the best lands available, with few restrictions as to size, shape, and survey status, means that the State will probably be a dominant future influence in the lands picture in Alaska. Residents of Alaska during the year initiated their own homestead rush, perhaps in the belief that the Statehood Act would mean a marked decrease in homesteading opportunities under Federal law.

The Congress enacted a measure which should bring an early end to the satisfaction of land grants to the States other than

Alaska. Public Law 85-771 (August 27, 1958) established new rules for the selection of lands from the vacant public domain to replace lands in earlier school land grants which the States had not received.

The new law corrected certain inequities and modified selection rights for State-owned lands within Federal reservations. The law permits States to select mineral lands when the original granted lands absorbed in Federal reservations also contain minerals. The State may also select lands under a Federal mineral lease if the lands are not already in production. Closing of the State land grant accounts is desirable both to insure that the States receive all the lands they were granted and also to end the disturbing influence that unsatisfied grants have had on public land management and disposition programs.

Another enactment of significance was the amendment of the Desert Land Act to permit entry of disconnected tracts under certain conditions and further encourage reclamation of arid lands (Public Law 85-641, August 14, 1958).

The settlement laws of Alaska were amended to permit acquisition of the surface of lands valuable for coal, oil, or gas. This amendment (Public Law 85-725, August 23, 1958), will encourage development of Alaska and protect the investments of developers of lands which turn out to be valuable for these minerals.

Another important legislative act extended the land leasing provisions of the Recreation and Public Purposes Act to the Oregon and California Railroad grant lands (O&C) in western Oregon (Public Law 86-66, June 23, 1959).

By the end of the year, the Congress had taken partial action on several legislative proposals of the Department. Of particular interest was the proposed Urban and Business Sites Act. The law would apply the first new concept of public land disposition since the Small Tract Act of 1938. The bill recognizes the growing importance of the public lands in the industrial and residential future of the country.

The proposed bill would provide three ways of making public lands available for residential and commercial purposes. Lands could be sold to local governments. Lands could be sold outright at public auction, or lands could be leased or sold in lots or blocks.

Another bill in Congress would revise the public land townsite laws by substituting one modern law for a host of outdated existing laws.

Another legislative proposal of great interest would lift the present 640-acre limitation imposed by the Recreation and Public Purposes Act on the amount of Federal land a State may obtain

annually for park purposes. The present limit has seriously hampered many State park programs.

The Department also sponsored proposed legislation to provide authority for more efficient public land administration.

Embodying a 5-point program, the proposed bill would authorize the Secretary of the Interior to:

1. Study and enter into cooperative agreements in carrying out his responsibilities on Bureau of Land Management lands.
2. Modernize provisions for the payment of fees required as service charges.
3. Use forfeited deposits to rehabilitate lands damaged by defaulting timber purchasers.
4. Accept donations for improvement or management of public lands under his jurisdiction.
5. Require users of BLM roads or trails to deposit sufficient money for adequate maintenance.

Regulations

Final regulations were adopted under which Alaska will select more than 103 million acres of Federally-owned lands it was granted upon admission to the Union.

The Alaska statehood legislation did not specify the lands to be transferred to State ownership and the new State will have 25 years to select the granted lands. The regulations spell out the procedures which the new State must use. The regulations comply with the Alaska Statehood Act and give the details by which the Department of the Interior will handle State selections. The regulations also incorporate previous rules relating to two earlier land grants.

A comprehensive and more flexible system of controlling billboards on Federal lands will result from proposed regulations conforming to standards set for the interstate highway system.

The proposed regulations provide for close coordination between public land billboard and advertising standards set up by the Department of Commerce as part of the expanded Federal highway program and the standards set by State and local authorities for other highways and roads. The regulations would also permit additional standards as necessary in particular circumstances.

Other new regulations adopted during the year included Circular 2012 relating to rights-of-way. These regulations facilitate the use of a right-of-way (either applied for or granted) by authorizing an additional right-of-way ingress and egress when required.

Circular 2013 spelled out the procedure for agencies to relinquish

withdrawn or reserved Federal lands so that appropriate disposition may be made.

Classification and Adjudication

The land classification process to determine the highest and best use of land is a basic part of the Bureau's land management job. The classification program for fiscal year 1959 resulted in 20,337 separate investigations and classifications. Improvement of the techniques and standards for land classification continued during the year.

The present classification activity is divided into two major programs. The first includes all of the classifications required to act on pending individual applications. The second is classifications prepared on "Bureau motion." The Bureau motion classifications are made before applications have been received from the public. Under the second program areas can be investigated and classified for management or for transfer to appropriate forms of tenure in an orderly and efficient manner.

An example of the latter type of classification action is the identification of areas suitable for development or disposition under the Small Tract or the Recreation and Public Purposes Acts. Another important example involves areas of isolated remnants of vacant land which can be classified as suitable for public sale. These often-scattered and isolated tracts do not usually fit into management plans for other Federal lands.

The results of BLM's land adjudication program are shown in the accompanying table. Behind the apparent progress shown in the figures is the fact that more than 50 percent of all the land filings have resulted in an unfavorable classification and subsequent rejection of the application. Much of this is the direct result of people having filed applications in the mistaken belief that it is possible to obtain "free" or inexpensive lands from the Federal Government or, at least, to obtain Federal lands for less than the lands are actually worth.

This orderly approach to action is also being stressed in the adjudication segment of the Bureau's lands program. An example is the current emphasis on the termination of certain antiquated activities such as State lieu selections, scrip applications, and town lot sales.

This is a joint adjudication and classification effort to finish up these tasks so that more emphasis may be given to the newer programs.

Adjudication of lands cases, Bureau of Land Management, fiscal year 1959

Type of case	Unclosed cases July 1, 1958	New cases during year	Reacti- vated cases during year	Cases closed during year	Unclosed cases June 30, 1959
Title transfers:					
Homestead.....	1,958	2,183	2,810	3,974	2,977
Desert land.....	6,830	3,575	1,056	4,705	6,756
Public sales.....	3,306	2,301	162	2,008	3,761
Selections.....	1,124	519	37	436	1,244
Exchanges.....	969	338	122	481	948
Land title cases.....	2,613	3,611	958	3,903	3,245
Small tract (unclassified land).....	19,436	5,188	630	4,024	21,230
Small tract application and drawing (classified land).....	6,105	1,665	6,648	9,115	4,950
Small tract (auction).....	128	1,270	110	1,166	342
Small tract (options).....	7,460	38	6,647	8,604	5,259
Recreation and public purposes sales.....	300	188	137	171	454
Total title transfers.....	50,229	20,876	19,317	38,587	51,166
Leases and permits:					
Nonmineral leases.....	108	60	24	84	108
Rights-of-way.....	2,078	1,732	793	2,943	1,660
Nonmineral permits.....	711	457	558	1,128	598
Nonmineral material sales.....	84	145	70	286	13
Recreation and public purposes leases.....	68	49	25	43	99
Small tract leases.....	68	100	143	152	159
Total leases and permits.....	3,117	2,543	1,613	4,636	2,637
Investigations:					
Trespass.....		8		4	4
Other.....		123	182	174	131
Total investigations.....		131	182	178	135
Other tenure actions:					
Withdrawals and reservations.....	981	426	34	500	941
Revocations and restorations.....	398	305	12	283	432
Offers of excess land.....		5	1	3	3
Total other tenure actions.....	1,379	736	47	786	1,376
Total.....	54,725	24,286	21,159	144,187	55,314

¹ An additional 669 cases were closed by inventory.

The State lieu selection program, where States are selecting lands to replace others which were granted but not received, should be close to completion within the next 5 years. Idaho and Utah are inventorying the extent of the lieu selections to which they are entitled and should begin their selections soon. Arizona's selections are 50 percent complete and should be completed by 1961.

After building up a substantial backlog of applications, California has not filed any new applications for several years. This backlog has been cut down substantially. The remaining applications are involved in complex appraisals, trespass, surveys, and mineral contests.

Since 1938 the Bureau's small tract program has resulted in the transfer of nearly 35,000 tracts to private ownership. These tracts are now being used as homesites, and for many forms of business and recreational use.

During fiscal year 1959, 9,091 small tracts were patented. This is equivalent to transferring title to the entire residential portion of a city the size of Cheyenne, Wyo.

In addition, many new areas are now being surveyed and subdivided for future sale. The bulk of the small tract program is concentrated in the southwest. The overall program is swinging toward direct sale of tracts through public auction and away from lease with option to purchase. This trend has been well received by the public.

In some areas heavy and uncontrolled small tract filings prevented an organized and orderly program. To remedy this situation areas in southern California and Nevada were closed to new applications under the Small Tract Act. High priority has been given to processing old applications and at the same time making additional tracts available on the Bureau's own motion.

Classification and adjudication activities have been doubly complicated on desert land applications due to the action of promoters and so-called land locators. These promoters have encouraged people to file applications by giving them false assurance that through very little effort or expense they will obtain "free" Government lands.

The classifications required for areas included in pending applications under the desert land law have represented a significant workload. Many adverse classifications have been made and a large number of applications rejected. In one action BLM's Los Angeles Land Office rejected some 1,000 desert land applications involving about one-third of a million acres of southern California lands.

As an example of desert land activity in California, several years ago 99 entries were allowed in Chuckawalla Valley, in southern California. Thirty-two have already been canceled for failure to make annual proof. Only three have indicated total compliance with the desert land law. The remainder are still pending. None of these entries shows evidence of successful agricultural development. In spite of such facts locator activities in this general area has been on the increase.

Private exchanges under Section 8 of the Taylor Grazing Act constituted a significant portion of the Bureau's land classification program during fiscal year 1959. Most of these exchanges were small transactions to consolidate land ownerships and improve the pattern of public lands. However, large exchanges were completed which in some cases made important additions to national wildlife and recreation areas and other reservations. Colorado's Great Sand

Dunes National Monument and Monta Vista National Wildlife Refuge both benefitted from such exchanges.

Public Recreation Land Use

The need for additional land for public recreation purposes is a critical national problem. Increasing population, personal income, leisure time, urbanization, and vacation travel will continue to aggravate the problem. Public domain lands administered by the Bureau of Land Management are already making important contributions to needed recreation areas.

Inventory was started of public domain lands having some special attraction which makes them suitable for intensive public recreation use. In the inventory particular attention was given to sea coast frontage and inland water shores and access lands.

The Bureau of Land Management has begun action to set aside a number of Pacific Coast public lands found valuable for recreation purposes in a Pacific Coast Recreation Area Survey conducted by the Department of the Interior's National Park Service. In northern Nevada several limestone cavern areas of possible national significance were classified for recreation.

Recreation on public lands is growing at a fast pace. BLM is helping make lands available for recreational development by States, counties, and civic groups.



The recreation land utilization program of the Bureau is a cooperative effort to afford suitable public lands to State and local governments for development. The results in a few States illustrate its effectiveness.

In California, a possible State park was identified along the Smith River and reported to the California outdoor recreation planning committee. In Oregon a redwood grove was set aside in the Big Trees Area so that it could be added to a State park. In Washington large tracts were classified on Pearrygin Lake for a public park, and on the Yakima River for a game area.

A cooperative effort was initiated to develop and maintain areas already receiving heavy recreation use along the Salmon River in Idaho. A potential historic monument was brought to the attention of the Arizona Recreational Committee. In Utah large areas were made available for State parks in rugged and colorful Snow Canyon, and at Dead Horse Point overlooking the spectacular Grand Canyon of the Colorado. Fifteen potential areas in Colorado were studied for possible inclusion in a State park system.

Interest of local governments in recreation land is high. Local agencies are beginning to realize that unless the lands and waters needed for public recreation are acquired now, it may be too late. There is growing competition for attractive lake shores, wild coastal areas, and accessible wooded lands. They also realize that there is high cost in waiting to acquire desirable recreation areas.

Vacant and unreserved land most suitable for public recreation areas will be classified by the Bureau for lease or purchase by State or local governments, and nonprofit organizations under the Recreation and Public Purposes Act. Land is made available at reduced cost by this act under conditions which insure its use for public recreation.

Withdrawals and Reservations

During the past year, 221 public land orders withdrew 1,350,746 acres of public domain lands and restored 958,510 acres from their withdrawn status.

Of the areas withdrawn, several were of significant size. For example, almost 124,000 acres were set aside for the Atomic Energy Commission operation near Arco, Idaho. Approximately 443,000 acres were set aside for the Marine Corps at Twentynine Palms, Calif., for training purposes.

Slightly more than 250,000 acres in national forests were further withdrawn from the operation of the mining laws for recreation areas, campgrounds, scenic strips, and administrative sites. Among

the areas withdrawn were lands at the site of the 1960 Winter Olympic Games in California. The Ancient Bristlecone Pine Forest, whose trees are believed to be the oldest living things on earth, was proposed also. Over 72,000 acres were withdrawn for reclamation purposes.

A review of existing withdrawals and reservations progressed this year. Its purpose is to reduce withdrawals to the minimum acreage required to adequately serve their purposes. It will promote increased multiple uses consistent with the primary use of the withdrawn lands, and eliminate withdrawals no longer needed.

A total of 24,652,967 acres in withdrawals were reviewed. Of this total, 10,719,079 acres were determined to be in accord with public need and 13,354,515 acres in need of adjustment. Holding agencies have requested the elimination of 1,223,626 withdrawn acres, reductions affecting 1,248,608 acres, and modifications of use on 4,058,663 acres.

Minerals

From the public lands come minerals and fuels for the Nation's industries—oil, natural gas, lead, zinc, copper, manganese, quartz, uranium, sulphur, sodium, potash, and others.

The public lands are known to contain a significant part of the unexplored and undeveloped mineral resources of the United States. These lands are being increasingly looked to as a source of future supply for the raw mineral materials needed for the Nation's growth.

Accomplishments

Mineral production from public lands during the last year rose, as the mineral leasing operations of the Bureau of Land Management continued to expand. From the public lands came more than 142,320,231 barrels of petroleum; 445,748,095 MCF (thousand cubic feet) of natural gas; 10,821,633 short tons of potash.

Oil and gas leasing of public domain lands has reached the highest point in history. Since 1945, when some 8,000 leases had been issued on about 4,500,000 acres, oil and gas leasing on June 30, 1959, reached a record total of 131,974 leases covering 107,155,290 acres.

The State showing the largest increase in leased land is Alaska, where 32,100,429 acres are under oil and gas leases. A year ago Alaska reported 19,552,999 leased acres. Wyoming followed Alaska in acreage under lease with 23,581,232.

At the same time leases on so-called acquired lands has increased from 162 leases covering 200,000 acres in 1947 (the year when the Acquired Lands Leasing Act was passed) to the 1959 total of 6,442 leases embracing 4,684,047 acres.

Coal, potash, phosphate, and sodium activities have also increased. There are presently 191,936 acres; 142,874 acres; 48,978 acres; and 62,622 acres, respectively, under lease for these minerals.

Revenues received under the mineral leasing acts, including rentals, royalties and bonuses totaled \$95,877,122. The 1958 receipts were \$95,369,102.

Adjudication of minerals cases, Bureau of Land Management, fiscal year 1959

Type of case	Unclosed cases July 1, 1958	New cases during year	Reactivated cases during year	Cases closed during year	Unclosed cases June 30, 1959
Title transfers:					
Mineral entries (BLM and other)-----	396	213	118	225	502
Mineral entries (Forest Service)-----	240	83	35	95	263
Land disposal conflicts-----	931	557	245	592	775
Mineral classification-----	141	104	1	140	106
Total title transfers-----	1,708	957	399	1,052	1,646
Permits and leases:					
Oil and Gas non-competitive (Public domain) {		55,956			
Oil and Gas competitive (Public domain) { Total..	18,432		24,914	81,233	18,069
Oil and Gas non-competitive (acquired lands) {		2,002			
Oil and Gas competitive (acquired lands) { Total..	2,372		1,553	3,687	2,240
Oil and Gas assignments and transfers-----	5,850	28,063		26,652	7,261
Oil and Gas overriding royalty assignments-----	22	3,767		3,789	
Other permits and leases-----	309	23	89	184	57
Coal-----	211	202	215	310	318
Potassium-----	496	652	378	1,105	421
Phosphate-----	27	20	20	41	26
Sodium-----	1,209	376	157	857	885
Hardrock-----	992	137	462	1,111	480
Mineral material sales (common varieties)-----	36	94	63	154	39
Outer Continental Shelf (Sec. 6)-----	17	23	17	24	33
Total permits and leases-----	29,973	91,315	27,868	119,147	29,829
Non-reimbursable investigations:					
Surface management (BLM and other)-----	1,377	1,050	49	1,309	1,167
Surface management (Forest Service)-----	5,833	6,331	1,364	3,474	10,054
Powersite mining claims (BLM)-----	745	638	560	1,208	735
Powersite mining claims (Forest Service and other)-----	104	110	63	221	56
Mineral claims and leases-----	167	166	3	155	181
Multiple use conflicts (non-disposal)-----	60	208	701	117	852
Special laws-----	498	1,268	41	635	841
Uranium-coal mining claims-----	116	150	1	267	
Total investigations (non-reimbursable)-----	8,900	9,921	2,782	7,386	13,886
Reimbursable investigations-----	3,343	3,157	39	3,062	3,477
Total-----	43,924	105,350	31,088	130,647	48,838

¹ An additional 877 cases were closed by inventory adjustment.

Mineral Leasing in Alaska

At the close of fiscal year 1958 Congress was considering legislation which would raise oil and gas leasing land rentals and royal-

Areas leased and bonuses received, competitive mineral leases, Bureau of Land Management, fiscal year 1959

Type of mineral and State	Public domain lands		Acquired lands		Total	
	Acres leased	Bonus received	Acres leased	Bonus received	Acres leased	Bonus received
Oil and gas:						
Alaska.....	16, 610. 00	\$223, 795. 16			16, 610. 00	\$223, 795. 16
Arkansas.....	160. 00	1, 008. 00			160. 00	1, 008. 00
Colorado.....	2, 351. 00	157, 014. 00			2, 351. 00	157, 014. 00
Kansas.....	360. 09	14, 759. 52			360. 09	14, 759. 52
Louisiana.....	649. 69	4, 606. 51			¹ 489. 69	4, 606. 51
Mississippi.....			243. 75	3, 704. 28	243. 75	3, 704. 28
New Mexico.....	4, 210. 00	360, 431. 00			4, 210. 00	360, 431. 00
Oklahoma.....	40. 00	4, 040. 00	160. 00	613. 00	200. 00	4, 653. 00
Utah.....	680. 00	14, 614. 60			680. 00	14, 614. 60
Wyoming.....	6, 258. 51	82, 213. 10	560. 00	16, 031. 80	6, 818. 51	98, 244. 90
Total oil and gas.....	31, 319. 29	862, 481. 89	963. 75	20, 349. 08	32, 123. 04	882, 830. 97
Coal:						
Colorado.....	3, 556. 00	73, 324. 00			3, 556. 00	76, 324. 00
Oklahoma.....	1, 680. 00	1, 764. 00			1, 680. 00	1, 764. 00
Utah.....	80. 00	80. 00			80. 00	80. 00
Wyoming.....	2, 769. 29	146, 011. 43			2, 769. 29	146, 011. 43
Total coal.....	8, 085. 29	224, 179. 43			8, 085. 29	224, 179. 43
Potash:						
Idaho.....	2, 480. 00	4, 992. 00			2, 480. 00	4, 992. 00
Montana.....	1, 272. 90	2, 550. 00			1, 272. 90	2, 550. 00
Total potash.....	3, 752. 90	7, 542. 00			3, 752. 90	7, 542. 00
Sodium:						
Wyoming.....	8, 636. 90	74, 126. 22			8, 636. 90	74, 126. 22
Grand total.....	51, 794. 38	1, 168, 329. 54	963. 75	20, 349. 08	52, 598. 13	1, 188, 678. 62

¹ Bonus forfeited, no lease issued on 160 acres.

ties in Alaska to the same level as those charged in other States. When fiscal year 1959 opened all oil and gas leasing in Alaska had been temporarily suspended (since May 2, 1958) while the legislation was before the Congress.

On July 3, 1958, Public Law 85-505 raised first-year lease rentals from 25 cents an acre to 50 cents an acre. The new rate was made effective as of the date leasing was suspended. The special Alaska royalty rate of 5 percent for the first 10 years was also raised to equal the 12½ percent charged elsewhere.

On September 3, 1958, the first competitive oil and gas leasing sale was held for Alaska lands. The area involved was some 16,000 acres in the Gubik gas field, located in north-central Alaska. At the sale 26 parcels were leased for \$223,795 in bonus bids and \$16,640 in rentals.

Also opened to noncompetitive mineral leasing were about four million acres adjacent to the Gubik area—all lands within the area known as PLO 82. Nearby Naval Petroleum Reserve No. 4 was not involved in any of the leasing actions.

Three development contracts have been entered into by the Department involving four major oil companies which will result in

the extensive exploration for oil and gas in previously undeveloped areas in Alaska. The contracts affect lands in widely separated parts of Alaska including 455,573 acres in the Becharof-Egegik area on the north side of the Alaska Peninsula, 229,000 acres in the Knik Arm area off Cook Inlet north and west of Anchorage, and 490,000 acres in the Katalla-Yakataga areas in southeastern Alaska.

Development contracts provide for oil and gas exploration, development and operation of the included areas by a single operator for holders of oil and gas leases who commit their leases to the contract. Such contracts do not grant exclusive drilling rights within the described area. Each lessee within that area is free to develop his own leasehold interest.

Operations under development contracts are exempt from the acreage limitations prescribed by the Mineral Leasing Act. The contracts do not change the rental and royalty rates. The large acreage committed to this kind of development program is necessary to warrant the investment of the capital necessary to carry on exploratory work in areas on which so little geologic information is presently available.

Wildlife Land Classification

A study of oil and gas leasing on lands set aside and administered for wildlife conservation purposes culminated in the adoption of special lease stipulations. The new rules assure full protection of the wildlife values and at the same time permit satisfactory development of the oil and gas deposits. Special classification studies are made of these wildlife areas to determine which areas can be opened to leasing without impairing the usefulness of the lands for wildlife conservation.

Approximately 1 million acres in the Kenai National Moose Reserve in Alaska were opened to oil and gas development during the past year. The remaining 1 million acres were closed to leasing because such activities would be incompatible with management for wildlife purposes. Similar classifications have been made of the Desert Game Range in Nevada, and classification agreements have been reached on several areas in California.

Acreage Limitation Enforcement

Action has been taken to enforce compliance with the acreage limitation prescribed for oil and gas leases under Section 27 of the Mineral Leasing Act. Since 1954 the acreage that may be held under oil and gas leases by an individual or company has been

46,080 acres in any one State (except 100,000 acres in Alaska). Prior to that time the limitation was 15,360 acres.

On January 8, 1959, regulations were amended to require disclosure of all parties having an interest in an offer to lease as well as lease assignments (transfers). The new rules also established a procedure for cancellation and forfeiture of interest held in excess of the acreage limitations.

Three contest proceedings have been initiated (two in Wyoming and one in Montana) against parties who are alleged to have obtained excess lease holdings either in their own name or through dummy applicants, relatives, friends, and employees.

An acreage control index has been set up in the Bureau's Land Offices to provide up-to-date records of lease acreages held or controlled by individuals and companies. The records are kept on a State-by-State basis.

Regulations

New regulations adopted during the past year greatly simplified the leasing of mineral deposits in unsurveyed public lands.

The changes in the mineral leasing regulations will have the effect of spreading the rectangular public land survey system over millions of unsurveyed acres.

The changes in the regulations, signed by Secretary Seaton on May 16, apply to all unsurveyed public lands and are of particular importance in Alaska. The new regulations mean that future oil and gas leases must cover rectangular areas, oriented to the cardinal points of the compass, which can easily be made to conform with the regular pattern of township, sections, and subdivision lines. An exception is made where the boundaries of unsurveyed lands may be in irregular form.

To facilitate mineral leasing the Bureau of Land Management uses a system of protracted surveys—lines drawn on maps that follow the public land survey system, even though the boundaries have not yet been laid out on the ground. Under the amended regulations lease offers in those areas where there are approved protracted surveys must use the land descriptions of the protracted survey. By using protracted surveys the BLM is replacing the more intricate language of metes and bounds land descriptions with the official language of the public land survey system in many unsurveyed areas.

Other proposed changes in the Federal oil and gas leasing regulations would assure all interested parties an equal opportunity to file applications for lands formerly under lease.

The new system would call for a period each month during which the previous month's canceled, relinquished, or terminated leases would be noted on the official records. Following this period interested parties would have opportunity to file lease applications for the lands involved and all applications would be treated as simultaneously filed.

The new system would also eliminate even the remote possibility of information about lands open to new oil and gas leases being unfairly obtained or used. The present system has placed a premium on making rapid searches of the records each morning so as to find lands available for leasing. The new proposed system would put everyone on an equal footing and would save much wear and tear of the records.

Legislation

Legislation to prevent the subdividing by assignment of Federal oil and gas leaseholds into leases covering less than 640 acres has been sponsored by the Department.

The proposed law would protect unwary investors against misleading advertising promotions which imply that many average citizens can "strike it rich" by speculating in a subdivided lease covering a small holding, usually 40 acres. Last April the Secretary publicly warned investors to be cautious over advertisements soliciting investments in oil and gas leases on Federal lands.

In past years many advertisements in newspapers and periodicals throughout the Nation have offered for sale to the public 40-acre oil and gas leases issued by the Government. The usual price of such a lease is \$100. These advertisements have often implied that many people can be lucky enough to "strike it rich", relying solely on the information offered.

Such advertisements have caused an unprecedented, tremendous influx of oil and gas lease assignments for 40-acre tracts and imposed a heavy burden on the various Land Offices. In 1952 steps were taken to restrict issuance of oil and gas leases of less than 640 acres. But advertisers were still permitted to subdivide their larger leases and assign or sublease 40-acre tracts.

The act of August 21, 1958 (Public Law 698, 72 Stat. 688), increased the maximum acreage of lands which may be held under coal leases or permits within any one State (exclusive of Alaska) from 5,120 acres to 10,240 acres. Leases or permits for up to 5,120 acres in addition to the 10,240 acres may be authorized by the Secretary of the Interior. Additional acreage would be permitted only after a public hearing. The exception would have to be in the public

interest and the additional acreage must be needed by the applicant to carry on business economically.

Other Mineral Activities

Under Public Law 167—the Multiple Surface Use Act—the Federal Government has the right to manage the surface resources (including timber and forage) on all unpatented mining claims staked after July 23, 1955. For all claims staked before that date, the Government may gain the right to manage the surface resources under a legal procedure provided for in the law.

The law was passed as a conservation measure to prevent mining claims from being staked or used for non-mining purposes and to prevent timber waste. Before the law was passed, neither the Government nor a miner could legally harvest the timber on an unpatented mining claim.

The legal actions spelled out by the law require BLM to examine areas to see if there are any unpatented mining claims. Following examination, a notice is published stating that a determination of surface rights on mining claims will be made. A miner may ignore the notice (in which case he loses no rights whatsoever, while the Government acquires the right to manage the surface resources) or he may file a so-called verified statement.

If he files a verified statement, BLM then determines whether the specific claim is valid under Public Law 167. If it is valid, the Government will not gain the right to manage the surface. If it is not valid, the Government obtains surface rights. Public Law 167 proceedings, however, are not used to determine the validity of a mining claim for patent purposes. Under Public Law 167 proceedings no miner loses any possessory rights or his rights to mine and to use as much of the surface as is necessary in his operations.

By the end of the fiscal year the Bureau completed preliminary examinations on 4,663,799 acres, with 4,508,856 acres having been included in published notices. This resulted in 451 verified statements being filed for 2,369 mining claims. Over half, or 1,732 claims have been examined as the result of filing verified statements.

On nearly 90 percent of the acreage under preliminary investigation, or 4,126,573 acres, determinations of surface rights have been completed. Of the total number of claims examined, the Government did not acquire surface resource management rights on 415 claims.

In addition to a full-scale program on public domain lands, the Bureau has also made publication or received requests for publication on behalf of the Forest Service, U.S. Department of Agricul-

ture, for 52,913,337 acres, and have processed verified statements involving 12,471 mining claims. Closing decisions have been issued, completing the determination of 12,333,172 acres, on which surface rights were not acquired by the Government on 197 claims.

Under the General Mining Laws, the Bureau of Land Management closed 1,052 cases involving title transfers. New and reactivated cases totalled 1,356. Approximately 15,014 acres were included in 110 patents issued during the fiscal year.

Public Land Surveys

En route by air on a trip from the eastern seaboard to the west coast, countless travelers have marveled at the wonderful symmetry of the farms and communities below. Stretched out below, as if part of a giant quilt, lie the squares and rectangles which molded the patterns of settlement and the development of the public domain.

Those squares and rectangles are made by the boundaries of townships, sections, and "40's" laid out by public land surveyors. These surveys are called cadastral surveys and they are one of the important jobs done by the Department of the Interior's Bureau of Land Management.

The public land surveys mark out boundaries on the ground and permanently record the survey data in the official field notes and survey maps (called plats).

About 74 percent of the total area of the original public domain has been surveyed. As of June 30, 1959, 475,426,559 acres remain unsurveyed, of which more than 76 percent is in Alaska.

The remaining unsurveyed land lies exclusively in the Western States, the largest unsurveyed area being in Arizona where approximately 32 percent of the State is unsurveyed. The unsurveyed area in Arizona represents about 20 percent of the total unsurveyed area outside Alaska.

Many of the markers set down by surveyors years ago have since disappeared or been destroyed. Some very early survey markers were made of wood. Other survey monuments have been buried in the rubble of development. Many of these lost or obliterated corners need to be replaced, and part of BLM's survey program is devoted to resurveying and redefining the boundaries of the public lands.

The 1959 program in the Western States has been directed particularly to areas involved in school land grants, to providing homesites for an expanding population, and to lands for timber management. It also was geared to the settlement of trespass cases, fixing



Surveyed boundary is cut through forest, requiring skill with axe as well as transit. The transitman is barely visible in the center of the picture.

of boundaries of Federal range lands, and development of mineral resources.

During fiscal year 1959, surveys covering 1,157,871 acres were officially accepted. More than 75 percent of this land was involved in resurveys. In addition, surveys of 1,937,460 acres were completed in the field during the fiscal year. Numerous other surveys which are not measurable on an area basis were also completed in the field during the same period.

During the year, the Bureau of Land Management spent \$2,498,400 making cadastral surveys. Approximately 85 percent of this amount came from funds appropriated to the Bureau by Congress. The Bureau was reimbursed \$242,116.61 for costs of cadastral survey work for other Federal agencies. Private contributions for carrying on the cadastral survey program amounted to \$13,329.81.

Alaska Surveys

In order to carry out the provisions of the Alaska Statehood Act which provides for the survey of the boundaries of land grant areas selected, the survey program has been greatly accelerated. The organization plan has been set up for a large program in 1960, personnel have been recruited and trained, and needed equipment has been purchased.

To facilitate mineral leasing the Bureau has adopted a system of "protracted surveys"—lines drawn on maps that follow the public land survey system, even though the boundaries have not yet been laid out on the ground. By using protracted surveys BLM is replacing the more intricate language of metes and bounds land descriptions with the official language of the public land survey system in many unsurveyed areas.

Protractions will be used for locating oil and gas leases and provide a means for graphically recording transactions dealing with public lands.

In Alaska it is anticipated that protractions will help the new State in its selections and will simplify survey of the exterior boundaries of selected areas. Protractions will not take the place of the final official survey but they will provide a present basis for many types of administrative actions in leasing and describing lands until surveys can be made. The survey and monumentation of township boundaries and section lines is necessary for the issuance of patent.

Particular emphasis has been placed on the need of preparing the protraction diagrams for Alaska where the rectangular system has been extended over less than one percent of the State. Approximately 30 million acres of unsurveyed land in Alaska were covered with protraction diagrams during 1959.

Practical uses of photogrammetry have been developed in making cadastral surveys. Aerial photographs are now being used in the official method of locating water boundaries.

A project to test the application of photogrammetry on original surveys has been initiated in Alaska. A test of that procedure has been completed in Utah but the results are not conclusive as to the practicability of using the method for complete surveys. The results of the Alaska test should further determine the usefulness of photogrammetry.

Outer Continental Shelf

Work has been continued in the mapping of the coastline and preparation of leasing maps as the basis for the administration of

lands on the Outer Continental Shelf. These maps locate tracts on the seabed for leasing oil and gas resources. During the year maps were prepared covering about 450,000 acres off the Florida Keys.

Forestry

Providing management and administration for 161 million acres of forest and woodland, about one-third of which has present or future commercial value, is an important function of the Department's Bureau of Land Management.

Timber is a resource which, if wisely used, can make a perpetual contribution to the Nation's continuing growth and development. Forest management under the principles of sustained yield points the way toward continuing growth. The volume of timber that can be put on the market annually under sustained yield (called the allowable cut) can be much greater when management practices are intensified.

BLM recognizes that the needs of a growing population have created the necessity for more intensive management of the forest resources. The Bureau is going ahead as rapidly as circumstances permit, to apply all those practices which will help develop the full timber growing potential of its forest lands.

From lands which the Bureau manages came enough sawtimber for lumber and plywood to build nearly 100,000 average houses.

Also harvested were some 222,630 posts and 158,763 poles, for fences and telephone lines. In addition a host of other forest products flowed out of the woods and into America's industries and homes, including tens of thousands of Christmas trees.

Scope of the Forestry Program

Harvesting mature timber at the proper time and at a rate as nearly equal to the annual growth as possible is a major part of the Bureau's forest management plans. The timber is sold to the highest qualified bidder at public auction. Logging is done according to supervised plans.

The value of timber sold from Bureau lands during fiscal year 1959 was \$32,399,360 and the volume totaled 1,082,001,600 board feet—a new record. This is an increase of \$7,742,147 and 167 million board feet over the previous year.

Timber from the Oregon & California Railroad and Coos Bay Wagon Road grant lands in western Oregon accounted for 901,861,500 board feet of the total sold and \$29,421,660 of the total

value. These O&C lands are some of the most valuable and productive forest lands in the world.

Sales of timber and other forest products from the public domain lands accounted for 180,140,100 board feet and income totaling \$2,977,700. During 1959 less than 10 million board feet was harvested from the estimated 40 million acres of commercial forest lands administered by the BLM in Alaska. Because of the lack of demand for forest products in Alaska, only a minor percentage of the allowable cut is harvested each year. On the remaining public domain lands in the 11 western States, the annual cut is approaching the allowable sustained yield harvest.

During 1959 Bureau appropriations for forestry amounted to \$5,493,000.

Sales to Small Businesses

As a result of a 1958 amendment to the Small Business Act, the Department entered into a memorandum of understanding with the Small Business Administration in March 1959, regarding timber sales to small firms. As defined by the Small Business Administration, a small business is one employing less than 100 people. This definition would include the majority of companies with which BLM deals.

Each timber sale on the O&C lands averages approximately 2 million board feet. During the 3 years preceding calendar year 1959, small businesses purchased 39, 55, and 60 percent, respectively, of the volume offered. Regulations were proposed to provide sales exclusively for bidding by small business concerns.

Forest Land Rehabilitation

Increased forest land production is necessary to provide the forest products of a Nation whose population will probably top 300 million by the year 2000. In 1957 the Bureau began a greatly accelerated forest land rehabilitation program on the western Oregon forest lands.

More than 300,000 acres of these highly productive lands had been reforested naturally since the initiation of intensive management practices in 1937. A comprehensive reforestation inventory in 1957 showed that more than 150,000 acres needed artificial reforesting. These lands have suffered repeated fires. Some cutover lands did not restock naturally because of inadequate seed, competing vegetation, rodents and bad weather.

Before 1940 the value of a thousand board feet of Douglas fir timber on the stump was approximately \$2. Today, values average \$30 or more for a thousand board feet of standing timber, with occasional prices of \$50. Declining sources of high-quality, old-growth, privately-owned timber will continue to place greater demands on Government timber. This will doubtlessly result in a long-term trend of increasing values for federally owned timber. To meet this demand, it is essential that full forest productivity be attained at the earliest practicable time.

The accelerated reforestation program will place cutover and burned lands in production 5 to 20 years sooner than nature's normal processes. Reforestation helps raise the allowable cut.

Results of the accelerated forest land rehabilitation program to date have been substantial. In 1959, 33,000 acres were reforested; 22,000 acres by planting seedlings and 11,000 acres by direct seeding. Site improvement was carried out on 1,300 acres and rodent control conducted on 525 acres.

The Bureau of Land Management plans to have all of the O&C lands in production. So far some 60,000 acres have been planted.

BLM has also undertaken a program to reforest selected blocks of potentially productive public domain forest lands.

Forest Inventory

Much as a grocer or merchant must make a regular stocktaking or inventory so, too, must the forest manager conduct forest inventories to determine whether stock is at the necessary level.

The volume, quality and condition of standing timber in each class must be determined. Annual growth rate must be measured. Stands of overmature, high-risk timber, and those stands damaged by fire, insects and disease must be scheduled for harvesting as early as possible to avoid loss of marketable timber.

During the past year BLM completed the first comprehensive forest inventory of the 2 million acres of O&C forest lands in western Oregon. These lands now have the most up-to-date and intensive inventory of any comparable lands in Federal ownership.

The inventory process is a continuous one, with permanent plots and basic data from those plots recorded on punched cards. Plots will be reexamined at regular intervals in a continuous reinventory. Progress of sustained yield management will be gaged by results. Future determination of the allowable sustained yield cut will be guided accordingly.

The inventory was completed one year ahead of schedule by the accelerated efforts of Bureau forestry personnel. The information

obtained has made possible an increase of 104.9 million board feet in the annual allowable cut from the O&C lands. The total has been raised from 769.3 million board feet to 874.2 million board feet. Including an additional 125.8 million board feet of salvage timber, approximately 1 billion board feet is scheduled to be offered for sale from the O&C lands in 1960.

The economy of the western Oregon communities depends heavily on the production, manufacture and merchandising of lumber and forest products. Plans to increase the Bureau's timber sales program for 1960 will provide an estimated 2,000 additional man-years of employment in western Oregon. As population continues to grow in that area, BLM sales will help the forest industries provide more jobs.

The Bureau is making continued progress in a comprehensive inventory program for public domain forest lands in 11 Western States where BLM has the responsibility for management of 3.8 million acres of commercial timberland. Local communities are not often economically dependent on intensive development of scattered public domain lands. Yet the harvesting and merchandising of timber from these lands is an important contribution to the local economies. Information now on hand demonstrates that timber sales on these lands can be substantially increased in the future.

The nationwide forest resources survey has been extended to the new State of Alaska. These current inventory studies are the most comprehensive ever undertaken and will evaluate for the first time the true potential of Alaska's forest resources. At the present time a very small percentage of the annual forest production of Alaska is harvested.

Access for Management and Development

BLM forest management plans give high priority to the development of a network of forest access roads.

It is the policy of the Bureau to guarantee equal access to everyone qualified to bid on timber sales. The O&C lands are a checkerboard of intermingled ownerships. To assure access, BLM has a positive program to acquire hauling rights on privately owned roads and the right to build new roads when necessary.

Access is frequently obtained by negotiated reciprocal right-of-way agreements. Rights-of-way and road easements are also purchased. When satisfactory access to Bureau lands and timber cannot be obtained in any other way, the Government must exercise the right of eminent domain.

In the past 10 years the Bureau of Land Management has signed 471 road agreements with owners of intermingled land and 711 rights-of-way and road easements.

Roads are built either under the terms of timber sale contracts or by regular appropriations. In either case the Government owns the roads.

When roads are constructed under terms of timber sale contracts, the Bureau requires the successful bidder to build roads. Allowances are made in the timber appraisals for road construction. In this way the timber pays for the roads.

In areas of rugged terrain containing large stands of old-growth timber ready for harvest, and where the cost of constructing major forest access roads would be too high to handle through small timber sales, construction is financed by funds appropriated by the Congress. These access road funds are a long-term capital investment in intensive management.

Under an agreement with the Federal Government, the 18 western Oregon forest land counties are making available for road building and reforestation, about one-third of the 75 percent share of receipts to which they are entitled. The counties' contribution toward the 1959 access road construction program amounted to \$5,185,000. This is an outstanding example of Federal-State cooperative programs in action.

A total of 268.4 miles of mainline access roads and 38 bridges have now been completed, or are under construction.

Vigorous implementation of the Bureau's access road policy will continue to be a keystone in the management policy of the Bureau in the years ahead.

Range Management

Just two days before the close of fiscal year 1959 BLM marked the 25th anniversary of the Taylor Grazing Act. Passed in 1934, the Taylor Grazing Act is the source of BLM's important range management and conservation programs extending over more than 179,700,000 acres of Federal lands in 11 western States. Under another law, the Bureau also handles grazing and range management on some 1½ million acres in the State of Alaska.

In the first quarter-century of applied conservation on the Federal range, great strides have been made in building and rebuilding the productivity of the lands. In each of 59 organized grazing districts, BLM managers and technicians are welding together conservation

programs for soil, water, minerals, forage, forests, wildlife, and livestock.

Last year more than 10 million head of cattle, sheep and horses grazed on Federal range lands. Livestock use was divided among 26,769 ranch or farm operators who held 18,185 permits for the use of grazing district lands and 10,342 leases covering 17,331,238 acres outside grazing districts. The lands outside grazing districts are called "section 15 lands," after the part of the Taylor Grazing Act under which they are managed.

In addition, more than 1,250,000 big game animals obtained part of their annual food requirements from grazing district lands and uncounted thousands roamed other BLM lands.

During the past year, the Bureau has concentrated on managing the forage resources to insure their continued and growing productivity. Total Bureau of Land Management appropriations for range management included \$2,601,700 for grazing administration; \$3,828,200 for soil and moisture conservation; \$1,079,000 for weed control, and \$686,713 for range improvements.

General Range Conditions

Range conditions in the Federal range States varied widely during the year due to erratic patterns of rain and snow. In California the drouth has been acute. Use of the winter ranges was severely limited because of lack of stock water and actual use was probably less than licensed use. In Nevada, after experiencing very good range conditions during the spring and summer of 1958, precipitation was several inches below normal.

There are indications that Utah and the western slope of Colorado are again threatened with drouth conditions. Wyoming, Montana, and New Mexico ranges are in generally good condition, although some areas are below normal in southern Montana.

Idaho received normal precipitation during the spring of 1958 with above-normal forage production. In Arizona calf weights last fall were the heaviest on record. In Oregon the grazing season closed with above-average growing conditions. All Oregon ranges suffered from the lack of runoff to provide stock water, resulting in the concentration of stock around perennial waters.

Many ranges had a heavy carryover of old forage, and most livestock entered spring ranges in fair to good condition. There has been a continuing shift in livestock using the Federal range from sheep to cattle.



Fighting range fires and forest fires is tough, dirty work. Fires often start in areas many miles from water. Many fires are fought without water as men throw shovelful of dirt to beat down the flames and rob the fire of air. Last year was a critical range fire season.

Grazing Administration

An important addition was made to the Federal range on November 6, 1958, when President Eisenhower approved the transfer of approximately 2 $\frac{1}{4}$ million acres of Bankhead-Jones Farm Tenant Act lands from the Department of Agriculture to the Department of the Interior. These are so-called LU (Land Utilization project) lands.

Approximately 1,935,000 acres in Montana and 234,000 acres in New Mexico were transferred for management by the Bureau of Land Management under the Taylor Grazing Act. The transfer included management personnel and property. The Bureau is completing formal orders which will include these lands in four grazing districts in Montana and two in New Mexico.

Executive Order 10787 transferring these lands also covers about 11,000 acres in Texas and California which were transferred to the jurisdiction of the Bureau of Sport Fisheries and Wildlife of the Department of the Interior's U.S. Fish and Wildlife Service. About

17,000 acres in Montana were also transferred to that agency. About 4,400 acres within the exterior boundaries of the Fort Peck Game Range were transferred for joint administration by the Bureau of Land Management and the Bureau of Sport Fisheries and Wildlife.

Building Range Productivity

Approximately two-thirds of the Federal range in 10 western States have been covered by comprehensive field studies and surveys of range condition. One of the most important accomplishments in the administration and management of grazing districts in the 25 years they have been under Bureau administration is the halting of downward trends in range conditions. This was done while the ranges were receiving continued grazing use.

The tabulation below clearly shows the progress that has been made in 25 years. It also indicates the job remaining to be done.

What is happening on the range?

The trend from 1930 to 1935			The trend from 1954 to 1958		
Trend	Acres	Percent	Trend	Acres	Percent
Improving.....	1, 255, 000	1	Improving.....	36, 907, 417	25
Little or no change.....	7, 864, 000	6	Little or no change.....	85, 077, 297	56
Declining.....	118, 673, 000	93	Declining.....	27, 983, 308	19
Total.....	127, 792, 000	100	Total.....	150, 668, 022	100

¹ Does not include approximately 23 million acres in reservations.

² Does not include 6,730,000 acres of waste or unusable range.

Source: Data for 1930-35 from *The Western Range*, Senate Document No. 199, 74th Congress, 2d sess. (Washington, D.C., U.S. Government Printing Office), p. 116. Data for 1954-58 from BLM reports.

The Bureau continued to assign first priority to adjusting live-stock use on those areas of Federal range showing the most severe damage. Increased emphasis was placed on the adjudication program and the establishment of individual grazing allotments. Considerable effort was made to obtain reliable forage inventory data in areas where range adjudication was undertaken. Management plans were developed unit by unit as range adjustments were made, considering the needs of forage for wildlife in each of the units adjudicated.

Once the stocking rates are brought into balance with grazing capacity, later increases in the forage supply may be followed by an increase in livestock numbers. Range development programs are being initiated to improve productive capacity and bring back lost grazing capacity.

In connection with the adjudication program a new policy statement governing the conduct of resource surveys was issued during

the year. The new statements covers planning, conduct, and use of original surveys, resurveys, and rechecks of old surveys. In addition, the Bureau has made firm plans for cooperation with State and Federal land managing research agencies to improve the accuracy and reliability of range survey methods.

Progress has been made in programs designed to improve the pattern of land ownership within grazing districts.

As further components of grazing administration, range inventories and dependent property surveys continued to be important activities during the fiscal year.

The problem of managing ranges now dominated by cheatgrass has resulted in a Bureau request for a systematic study of cheatgrass ranges by the Intermountain Forest and Range Experiment Station of the U.S. Department of Agriculture. More than 2 years of observational research has demonstrated the need for a series of experimental pastures to obtain answers to many questions about the management of cheatgrass ranges. The study will benefit both users of cheatgrass ranges and public land management agencies.

Range Conservation and Improvement

Top priority for range conservation treatment is given to depleted areas where steps have been taken to balance licensed use with available forage. Conservation plans on a watershed basis are integrated with range management and other resource management programs. Practices carried out under the soil and moisture, weed control, and range improvement programs contributed to soil stabilization, water conservation and other aspects of watershed management.

Prominent land treatment practices applied include range seeding and brush control to increase the quality of desirable vegetation. Range seeding projects totalled 111,936 acres. Increased attention was given to the use of the anchor chain drag, rotary brush cutter, and to chemical treatment as a means of eradicating undesirable brush stands. Improved techniques in the use of such methods resulted in decreased costs and greater protection to the soil surface from wind and water erosion.

During the year, 52 detention dams, 41 diversions, and 2,284,286 linear feet of dikes and 350 reservoirs were constructed.

A major accomplishment during the year was the reevaluation and revision of the long-range conservation needs by major river subbasins. Experience gained since the beginning of the Department's soil and moisture conservation program has provided more

reliable estimates of needs on the 42 major subbasins involving Bureau lands in 11 western States.

Permittee participation and interest in the range conservation and improvement program has increased materially. Last year range users contributed \$302,318 to the soil and moisture program. This amounted to an increase of \$64,573 over the 1958 total. The large number of BLM conservation practices that are being duplicated on nearby private range lands is further evidence of the interest in and success of the program.

Close cooperation was maintained with land grant colleges and Federal research agencies to develop improved conservation techniques and to determine the effects of conservation practices on erosion control, sedimentation, and downstream water yields. An intensive range improvement and rehabilitation program was begun in cooperation with the Navy Department on the Naval oil shale lands in Colorado.

The range improvement program to build fences, develop stock water, construct truck trails and roads, and other needed facilities of improved range management was tied in more closely with specific grazing administration activities during the year. Priority was given to maintaining existing range facilities. Range users undertook a big part of this maintenance, permitting new construction by the Bureau. Improvements completed during the year included 709 miles of fencing, 48 wells, 76 spring developments, 136 miles of truck trails, and 144 cattleguards.

In addition, privately contributed funds permitted the construction of conservation and improvement projects involving 274 reservoirs, 521 miles of fencing, and 31 corrals. This work is done under authority of sections 4 and 15 of the Taylor Grazing Act.

The Bureau's fencing operations are part of the range management program. In fencing public range lands, the influence of fences on big game herds is taken fully into account. As the result of a study of fencing and antelope migrations, the Bureau has adopted fence standards which will minimize the effects of fencing on game movements.

Weed Control

The weed control program reduces the destructive influence of plant pests on BLM lands and prevents or reduces their spread.

Halogeton, a poisonous plant, kills several hundred sheep and a few cattle every year. About 11 million acres of range lands in 8 western States, including 8 million acres of BLM lands, are infested with the noxious weed.

It is now a firmly established fact that halogeton is seldom a problem on range lands with adequate good forage plants and grasses whose vigor can crowd it out. Livestock will seldom eat halogeton when other forage is available.

A natural avenue of attack on this weed is to crowd out halogeton with more vigorous livestock forage. Last year, more than 25,000 acres of halogeton-infested lands were seeded to perennial grasses. A chemical herbicide (2,4-D) was used on another 11,000 acres. Chemical control is now mainly used to treat isolated patches and to reduce the rate of spread from areas of heavy infestation.

Measures to improve the general condition of the range, such as waterspreading, contour furrowing and soil pitting are also used effectively against halogeton. Fencing to improve livestock grazing patterns and reduce over-use, along with other improved livestock management practices help to speed range recovery and reduce or check halogeton's spread.

Over 10 million acres of infested and threatened lands need further improvement to restore their productivity.

Over 57,000 acres in southern Idaho infested with annual host plants of the beet leafhopper were seeded to perennial grasses and fenced during 1959. This was an initial effort to control this serious insect pest and reduce agricultural crop losses from curly top disease.

Control of Medusa-head rye, an annual grass of low forage value and extreme competitive ability, as well as other troublesome weeds infesting various portions of the Federal range has been confined to a relatively limited acreage. Medusa-head rye has invaded over 700,000 acres of range land in Idaho and many thousands of acres in southern Oregon and northern California. Efforts to control these plants warrant expansion in the future.

Section 15 Lease Administration

Grazing lease rental rates were raised on section 15 lands to be consistent with the present section 3 grazing fee of 22 cents per cow month. Yearly lease rentals had varied from \$0.001 to \$0.600 per acre. The new schedule, which became effective April 20, 1959, established lease rentals at \$0.049 to \$0.880 per acre.

Wildlife and Recreation

The Bureau's fencing policy has been spelled out as it relates to the wildlife resource. It includes development of a model cooperative agreement for range development and improvement

work. Fencing of areas important to wildlife will only be done with proper safeguards for wildlife.

Public recognition of the role public lands play as a major recreational resource has spotlighted the need for improved access routes to Federal lands for hunting, fishing, and similar activities. BLM will meet the problem by developing entrance routes under cooperative agreements with landowners, sportsmen's groups, and others. Efforts will be made to improve the land pattern by exchange-of-use agreements, reciprocal use agreements, or exchange of land title to connect links between isolated areas. When it is not possible to work out cooperative access programs, BLM may then use whatever legal means are available and appropriate. If there is a large body of public land involved, and the access situation warrants, BLM may use legal means to acquire a suitable access route.

Alaska Grazing Resources

There is increasing interest in Alaska's grazing resource. As yet, however, detailed information about Alaska's grazing resources is extremely limited. During fiscal year 1959 there were 61 grazing leases in effect covering 1,510,107 acres.

Fire Protection and Control

No enemy of conservation rivals the destructive power of fire. Every year millions of dollars worth of valuable natural resources go up in smoke—forest, grassland, tundra, and desert forages. In addition to immeasurable losses of harvestable resources, fires also destroy the shelter and food for wildlife, and leave ugly, naked land to the mercy of rain and wind erosion.

Fire protection and control on lands cared for by the Department of the Interior's Bureau of Land Management is a job of enormous dimensions. It involves fire protection and fire suppression on a total of some 386 million acres, of which about 225 million are in Alaska and 161 in 12 other States.

During calendar year 1958 BLM fire suppression crews went into action on 1,359 fires and held the burned area to 933,796 acres. In 1957 1,230 fires had burned 5,531,807 acres. Of the 1958 total, 824 of the fires burned 676,253 acres on BLM lands. The 535 other fires swept over 257,543 acres of adjacent private lands and were put out by the Bureau to protect nearby BLM lands.

In California, Oregon, Washington, Idaho, Montana, New Mexico,

and Minnesota the Bureau handles part of the fire control job through protection contracts. These contracts are made with other Federal, State, or local agencies. On lands under contract protection 299 fires burned over 11,771 acres. The total cost of contract fire protection during fiscal year 1959 was \$1,005,000 for the safeguarding of some 5,736,300 acres.

Smokejumpers

During the past year the Bureau has given top priority to the development of a smokejumper installation in Fairbanks, Alaska. This involved constructing the necessary headquarters facilities, parachute loft, and the modification of a cargo plane to permit safe exit on fire jumps.

By the end of the fiscal year 15 seasoned smokejumpers were helping to solve one of the most difficult problems facing fire control efforts in Alaska—getting to fires while they are still small. These smokejumpers, for whom the glamour of parachuting onto forest fires soon turns to seemingly endless hours of smoke and fatigue, make it possible to put skilled teams on many fires in the remote interior of Alaska which in the past would have burned uncontrolled until stopped by nature.

By the last day of the fiscal year, BLM's 15 smokejumpers, who had been on duty less than a month, had already made 109 jumps on 25 fires. They had completely put out 11 fires, including one that had spread to 30 acres. But the blowup conditions which Alaska fire control men faced could hardly have been encouraging. On that same day there were over 70 fires burning. BLM had 538 emergency fire fighters and 31 permanent BLM personnel on 23 of these. Forty-seven fires were as yet unmanned and uncontrolled.

BLM has greatly expanded the use of borate drops to put out fires or hold the lines until ground forces arrive. During the 1958 fire season 240 tons of borate (a chemical that is mixed with water to form a slurry that is spread from airplane tanks) were dropped on fires in Alaska. In the early weeks of the 1959 season Alaska fire fighters had already dropped 172 tons during 127 sorties. Twenty-seven fires had been completely controlled by borate alone. Other drops had greatly helped the ground crews in their struggles to control the fires. Borate has also been used in large quantities on western range fires.

BLM's increased efforts to control Alaska fires are hampered by size of the State and the geographic facts-of-life. Distances are long, summers are very dry, and dry lightning storms are common



Billowing smoke marks an Alaska forest fire. Two smokejumpers will soon be on the job. The canopy of each jumper's parachute is visible above and to the left of the fire's base.

during the summer months. Even with the help of smokejumpers, borate dropping planes, and the most modern equipment available, a severe fire season and large burns are still possible.

Fire conditions on western range lands have been severe. Heavy growths of fast-burning fuels and an increased number of lightning storms teamed up to produce the conditions that could have led to a disastrous fire year. In spite of these conditions BLM held the burned area to 617,000 acres.

Fire weather stations installed last year have furnished data for the new fire danger rating system. As a result the Bureau was better prepared to meet fire conditions as they arose, and standby crews are ready to move in swiftly as soon as a fire is reported.

Other special projects to improve fire control on western range lands included the installation of additional radio equipment, stepped-up use of borate drops and greater use of helicopters to speed crews to and from fires.

Fire control involves two appropriations. One is for presuppression operations. This must take care of all the costs necessary to



Geronimo! Alaska smokejumpers help BLM get to fires sooner and control them while they are small. The helmets and wire face masks protect the men from limbs and branches.

acquire and maintain BLM's fire fighting equipment, supplies, buildings, aircraft, and so forth. It pays for training crews and pays their salaries while they are not actually at fires. It also pays for all of the fire protection contracts. The other fire appropriation covers the actual cost of fire suppression.

The BLM appropriation for presuppression during fiscal year 1959 was \$890,100 of which \$625,000 covered presuppression activities in Alaska. Fire suppression costs during fiscal year 1959 totaled \$2,989,718, of which \$1,457,032 was spent fighting fires in Alaska. The total amount spent for fire protection is, of course, only a small fraction of the value of the resources involved.

Eastern States

The remaining scattered areas of public domain lands in Alabama, Arkansas, Florida, Louisiana, Mississippi, Michigan, Wisconsin, and Minnesota are administered by the BLM's Eastern States Office. Under the program of the Eastern States Office the area of public domain lands in the East is rapidly diminishing, as lands are transferred out of Federal ownership to States, local governments, organizations, and individuals.

In 1959 the Eastern States Office transferred title to 19,840 acres of public domain lands to non-Federal ownership; 13,104 acres were sold at public auction; and 4,248 acres transferred to individuals under the Color-of-Title Act. A total of 808 acres was transferred to States and local municipalities under the Recreation and Public Purposes Act in addition to 1,680 acres under state grants and indemnity selections. Receipts from sales amounted to \$414,172.

Noncompetitive mineral leases and permits on both public lands in the above States and on acquired lands in the 18 non-public land States, where the Eastern States Office has responsibility for subsurface resources, accounted for \$656,436 during the fiscal year ended June 30, 1959. Total amount received from mineral leasing (including competitive leasing) during this period was \$3,213,258.

As a means of increasing and consolidating services to the public the Russellville, Ark., office was closed May 1 and the remaining work transferred to the New Orleans office. Because of the small acreage of public lands remaining in the Gulf States, area sales were discontinued. Any lands remaining are open to individual application through the New Orleans office.

The local field office at Bemidji, Minn., was transferred on May 1 to St. Paul, Minn. The St. Paul field office provides close contact with the State Department of Conservation in working out a co-operative program for the important resources on approximately 75,000 acres of public lands remaining in Minnesota, much of which the State can acquire and administer.

Public lands remaining in Michigan and Wisconsin will also be open for application through the St. Paul office.

Three major accomplishments under the Recreation and Public Purposes Act during 1959 were:

Cayo Costa Island in Florida.—After several years of negotiations with the county, a plan of lease and purchase of the 655-acre tract was worked out. Patent was issued September 3, 1958, for 77 acres and the balance leased for one year. This will be repeated each year until the total acreage is purchased.

St. Francis River Floodway in Arkansas.—With the concurrence of the United States Fish and Wildlife Service of the Department of the Interior, a similar lease-sale plan was worked out with the Arkansas Game and Fish Commission. The Commission will purchase approximately 600 acres annually of some 4,000 acres in the St. Francis Floodway now withdrawn for public hunting. The first application for 639 acres has been received. No change in use is planned.

Gulf Breeze Tract in Florida.—With the help of Santa Rosa County and other interested parties, the Bureau has arranged a program for acquisition of a valuable 187-acre tract on Santa Rosa Sound across Pensacola Bay from Pensacola, Fla. Santa Rosa County agreed to apply for the entire tract with the understanding that other interested parties would be permitted to develop and use portions of the area. The area is very valuable for recreation, civic, and residential purposes. A resurvey is now being made.

Outer Continental Shelf

On May 26, 1959, the Bureau of Land Management Office at New Orleans, La., resumed an active oil and gas leasing program when some 458,000 acres of submerged lands off the southwest coast of Florida were offered for lease sale. The sale resulted in 23 leases totaling 132,480 acres with bonus bids amounting to \$1,711,872. The area was not part of the lands involved in the boundary dispute pending before the United States Supreme Court.

The office in New Orleans, administered by the Bureau's Eastern States Office, maintained 381 active OCS leases embracing 1,473,452 acres. From the leases and pipeline rights-of-way \$3,412,204 was collected in lease rentals and royalties. Fifteen applications for pipeline rights-of-way were approved during the year.

On May 1, 1959, the functions of the New Orleans office were expanded to include land applications and claims work in the southeastern public land States.

International Cooperation

Experienced technicians of the Bureau, in support of international technical assistance programs, are assisting other countries in adapting fundamental principles of land and resource management which have proven successful in the United States. These include cadastral engineering survey systems for accurate ownership boundaries,

land record methods, land use classification, public hearings, adjudication of conflicting applications and claims, mineral leasing, and grazing and forestry programs. Officials throughout the free world constantly observe BLM technical responsibilities, policies, legislative authority and operating methods. BLM experience on resource management is reaching most countries.

During the year more than 75 officials and technicians from other countries visited Bureau offices.

Appeals

Under Departmental regulations, anyone who has been adversely affected by a decision issued by a Bureau of Land Management field office may appeal to the Director. Such appeals cover all BLM land offices and hearing examiners. The appeals are handled in a special division of the Director's Office established in April 1955.

At the beginning of the fiscal year there were 2,272 appeals awaiting action. A total of 4,819 were received during the year. A total of 4,600 appeals were disposed of by 1,608 separate decisions. In addition 2,590 miscellaneous letters and memoranda were prepared in connection with appeals. There were 2,491 appeals remaining on hand at the close of the fiscal year.

The number of appeals disposed of during fiscal year 1959 was more than double the 2,141 appeals acted on during the previous fiscal year. Thus almost twice as many new appeals were received and disposed of during 1959 than in the previous year.

In one area alone, appeals on 740 desert land applications, covering more than a quarter-million acres in seven southern California valleys were processed by the Appeals Office.

During the year the Bureau and the Department began a comprehensive study of the appeals system and the ways in which appeals are handled and treated.

Hearings

During the year 328 proceedings were referred to Bureau Hearing Examiners for formal hearings as required by law or by the regulations of the Department. Included were 93 appeals and 3 enforcement proceedings under the Federal Range Code, and 232 proceedings to determine the validity of 924 mining claims and other types of land entries.

Hearings were conducted in 136 lands and minerals proceedings during the year and in 60 grazing cases. Hearing Examiners closed 297 cases on their dockets, including 95 grazing cases and 202 lands and minerals proceedings involving 537 claims and entries. In 164 of the closed cases, decisions "on the merits" following a hearing were rendered. The remainder were closed without a formal hearing. Unclosed proceedings at the end of the year numbered 295, including 112 grazing cases and 183 lands and minerals cases.

There was increased activity under both the act of August 13, 1954 (Public Law 585), which provides for multiple mineral development of public lands, and the act of July 23, 1955 (Public Law 167), providing for multiple use of the surface of unpatented mining claims.

During the year, Hearing Examiners received proceedings under the 1954 act involving 289 mining claims, compared with 34 claims during the previous year. Proceedings under the 1955 act referred to Examiners during the year involved 236 claims, more than twice the number in fiscal year 1958.

The Bureau prepared a compilation of decisions rendered by the Department during the period 1936-58 in cases arising under the Federal Range Code for Grazing Districts. The printed, one-volume compilation, with index-digest, will be available from the Superintendent of Documents.

Program Coordination

An increasing population places heavy demand on America's natural resource base. More timber products, more meat, more water and more land for industrial uses and recreation are needed. Providing for these needs, which are often in competition with one another, requires forethought and planning. The Bureau has, for the last 4 years, been developing and refining a system for the concise expression of these plans.

In order to receive the most benefit from both field and headquarters experience the system has been designed, reviewed and modified by committees representing all levels of all activities in the Bureau. The system therefore provides a mechanism for submitting balanced programs that reflect national needs as well as local situations.

At a third Bureau-wide program conference the system was further refined and many procedures were simplified. The system has, for the past 2 years, included a method for reporting progress

at the end of each quarter. The quarterly progress reports were revised to provide a concise and complete progress report which can be rapidly summarized at all levels.

Management Improvement

One of the ways in which the Bureau tries to handle more work with increasing efficiency is by constantly improving office procedures and methods. Using all of the tools of management improvement, BLM offices are constantly working to do a better job in its public service functions. Central leadership and control of these efforts is furnished by the Management Improvement Office.

The number of employee suggestions received, the number and percentage approved, the benefits realized and the amounts paid in awards all showed significant increases over the past year. The number of persons receiving cash awards for sustained superior performance increased almost 20 percent. One award for distinguished service was given, meritorious awards were made to six employees and commendable service citations were made to eight persons. A Bureau candidate received a meritorious award from the William A. Jump Memorial Foundation for exemplary achievement in public administration.

The Bureau Forms Control Program continued to make progress. Thirty-five members of various Bureau staffs in the headquarters office participated in a workshop on forms improvement. Similar workshops are planned in several field offices for the coming year.

The Bureau has established a new management improvement project reports system. The new system creates a simplified scheduling and reporting procedure. Fifty-three new projects were started during the year, 56 completed, 3 canceled, and 40 remain in progress.

Special management surveys were made in the Socorro and Farmington, N. Mex. District Offices and the Santa Fe, N. Mex. Land Office. The District Office studies resulted in better understanding of grazing district operations and problems not only in those two districts but others as well.

As a result of a study of the appeals office, the organization of that office was changed to simplify lines of supervision and control in the preparation of decisions on appeals to the Director.

Records Improvement Project

The Records Improvement project is installing a modern status recording system which will show the title, use, and availability of

the public lands and resources administered by the Bureau of Land Management. The new records will replace old records that have deteriorated with age and use.

During fiscal year 1959 two records revision contracts were completed and a third contract was awarded. The pilot Utah contract was completed in 1958. A contract for revision of the Oklahoma status records was also completed on September 17, 1958. A similar contract for New Mexico was completed April 27, 1959. The total cost of the records revision programs for Oklahoma and New Mexico was \$275,986 and \$695,595 respectively.

On October 7, 1958, a contract was awarded to a Massachusetts firm for preparation of new records for the State of Arizona. At the end of the fiscal year this contract was 13 percent completed.

Personnel Management

Special attention was given during the year to the recruitment of additional employees for service in Alaska to meet the new obligations placed upon the Bureau. New employees for the accelerated survey program included cadastral surveyors, cartographers, cartographic survey aids, photogrammetric aids, draftsmen and compilation aids. As of June 30, 1959, there were 67 employees in the above categories assigned to the Alaska survey program.

As of this same date, there were 2,366 permanent and 782 seasonal employees on the rolls of the entire Bureau. This total was distributed as follows: Area 1 (Washington, Oregon, California), 692 permanent and 210 seasonal; Area 2 (Idaho, Nevada, Utah, Arizona), 517 permanent and 282 seasonal; Area 3 (Montana, Wyoming, Colorado, New Mexico), 570 permanent and 139 seasonal; Area 4 (Alaska), 265 permanent and 122 seasonal; and Eastern States Office and Director's office (Washington, D.C.), 322 permanent and 29 seasonal.

Revisions were made in the Bureau's Promotion Plan to meet the requirements of the new Government-wide promotion plan inaugurated by the Civil Service Commission on January 1, 1959. The Bureau since 1955 has had a formalized promotion plan in operation which met most of the Commission's requirements.

Training

The Government Employees Training Act provided emphasis for training and authorized attendance of several employees in specialized sessions at non-Federal facilities when training was not avail-

able within the Government. The Bureau Training Committee was expanded to provide better guidance of training activities under the act and to aid in determining policy in training and in attendance at meetings.

Six employees participated in the Tenth Departmental Management Training Program. Three employees completed the Middle Management Training Program with one representing the Department as a Civil Service Commission intern. Three employees also participated in the management program conducted by Consolidated Administrative Services in Portland.

Emphasis in training continued to be in the principal functions of the Bureau but with an increase in sessions on administrative services.

Bureauwide conferences were held in forestry, range, minerals, lands, cadastral surveying, personnel, and budget and finance. Land classification and appraisal was the subject of two week-long conferences which included all lands officers and land examiners.

Safety

During the year, Safety Officer positions were set up in Areas 1 and 4, and plans made for establishing such positions in the other Areas. This was done by adding safety duties to existing positions. Emphasis was given to training the incumbents as well as members of Area and State Safety Committees.

A satisfactory decrease in accidental injuries and property loss was accomplished during the year.

Procurement and Supply

Special attention has been directed toward obtaining improved office and warehouse facilities for BLM activities to improve operations and provide better service to the public. During the year, 19 Bureau offices were moved to new space or received additional space assignments.

New or improved warehouse facilities were acquired in 11 locations. In addition, 8 small portable buildings to house radio stations in eastern Oregon, and 16 quonset huts for storage in Alaska were acquired from other agencies at no cost to the Bureau.

Continued emphasis has been placed on procurement and property management throughout the Bureau. Improvements in this field include the decentralization of these functions in Alaska, and the steady Bureauwide improvement in the form and content of invita-

tions to bid on contracts. Complete standardization of certain types of contracts and the use of standardized clauses in others has reduced the time and work involved in preparing bid invitations and significantly expedited procurement.

Excess property with an original acquisition cost of \$656,000 was acquired by the Bureau at no cost. During the year, excess property with an original cost of \$98,000 was reported to the General Services Administration. The excess property was transferred to other agencies, donated to educational or public health agencies, sold, or junked.

Finance

Total appropriations (including supplemental appropriations) for the Bureau's management operations during fiscal year 1959 amounted to \$26,910,100; for construction, \$5,685,000; and \$686,713 for range improvements.

The work of the Bureau is financed by the Management of Lands and Resources appropriation and is divided into 10 functional activities representative of the Bureau's responsibilities. The suppression of fires on timber and grazing lands under the jurisdiction of the Bureau required a supplemental appropriation of \$2,500,000 in 1959.

The Bureau's program for construction encompasses the construction of access roads to timber resources principally on O. & C. lands and to a smaller extent on other lands under the Bureau's jurisdiction, as well as the building program in Alaska largely for fire protection facilities.

Receipts

Gross receipts from the sale and management of public lands and resources during fiscal year 1959 totaled \$136,720,871. These receipts came from the following sources: mineral leases and permits—\$95,877,122 (including \$3,412,204 from rents and royalties on the Outer Continental Shelf); timber sales—\$31,750,860; sales of public lands—\$4,239,230; grazing leases, licenses, and permits—\$3,067,261; fees and commissions—\$1,265,544; rights-of-way \$127,211; and \$393,643 from all other sources.

Bureau of Land Management receipts for fiscal year 1959 were distributed as follows: \$51,342,957 to 27 public land States (of which \$14,761,926 went to the 18 western Oregon timber land counties); \$48,782,262 was deposited to the Reclamation Fund; \$32,412,820 went into the General Fund of the Treasury; \$2,996,684 was trans-

ferred to other Government agencies; \$417,495 was earmarked for Indian Trust Funds; and approximately \$768,653 was returned to the grazing districts for range improvements.

BLM receipts since organization of the Bureau in 1946 have now totaled \$1,213,489,540.

National Park Service

Conrad L. Wirth, *Director*



ON JUNE 30, 1959, the Mission 66 program of the Department of the Interior's National Park Service was poised to push forward into the fourth year of its 10-year program to assure the development and protection of the National Parks, Monument and Historic Sites for the enjoyment and inspiration of future generations.

As fiscal 1959 ended, the National Park System was in the best condition in its history. Almost everywhere throughout the Department's 181 park areas, improvements promised when the program was launched in 1956 were becoming visible.

Yet, even as the new improvements came into being and as park staffs were increased, it became clear that even more strenuous efforts must be made in the coming years to keep abreast of the ever-rising tide of visitors.

In the first 6 months of 1959 visitation to the parks was 8.5 percent above the total for the same period in 1958, and it was estimated that visitation for the 1959 calendar year would approximate 62,000,000 or 6.2 percent more visitors than were recorded in the previous year.

The challenge confronting the Service now is to push its Mission 66 program forward with all possible vigor and speed to meet the steadily rising demands of the people for enjoyable and educational use of the National Park System.

When Mission 66 was launched on July 1, 1956, it was planned that orderly progress, year-by-year, would find the National Park System properly staffed and equipped to care for 80,000,000 visitors in 1966—the 50th anniversary of the establishment of the Service.

Bold and forward looking as original Mission 66 planning was, it already has become apparent that it is insufficient to meet the unexpectedly swift increase in demands being made upon the Park System. Already it is evident that more than 80,000,000 people will

visit the parks in 1966 and plans must be made now to provide the facilities and the staffs to accommodate them. A restudy of the original Mission 66 program is under way.

The intensive use made during the past year of new facilities and services attested to the soundness of the plans for development, management and protection of the parks under Mission 66. New visitor center buildings, roads, trails, campgrounds, and other facilities were scheduled to open for public use during calendar year 1959, and many contracts have been let for further construction.

During the past fiscal year, 710 projects involving an investment of \$59,083,000 were either placed under construction or committed for construction, and an additional 708 projects worth \$36,616,000 were completed. Since Mission 66 was launched, 1,946 construction projects involving an investment of \$96,459,000 have been completed.

While construction projects may have provided visitors with dramatic examples of Mission 66 progress, much was accomplished "behind the scenes" to better protect the wilderness and the wildlife and the priceless historic buildings and treasures that have been entrusted to the care of the Department of the Interior.

During the year, 218 new permanent employees were hired to manage, protect, and maintain the parks. Total staffing under Mission 66, has increased almost 10 percent from about 7,200 permanent and seasonal employees on June 30, 1956, to nearly 8,000 on June 30, 1959.

Thirteen new visitor centers have been placed in operation and 20 others were under construction this year.

With the completion of the final stages of the Jamestown Tour Road in Colonial National Historical Park, the Heart O' the Hills Road in Olympic National Park, and the entrance road at Arches National Monument, a total of 20 miles of new park routes were opened to the public.

Outstanding among the major roads projects placed under contract during the year were: The Thornton Gap Interchange and approaches at Shenandoah National Park; reconstruction of Union Avenue at Vicksburg National Military Park; the entrance at Mesa Verde National Park, paving of the Lassen Peak Highway at Lassen Volcanic National Park, reconstruction of the South Entrance Road at Zion National Park, reconstruction on the Jackson Lake Road at Grand Teton National Park and the construction of grade separations on 14th Street and the Mall in the District of Columbia.

The National Parkways program also continued at a high rate of construction and concentrated on closing gaps of Parkway construction and providing additional visitor facilities along the completed sections. The Federal-Aid Highway Act of 1958 provided a \$16 million authorization which was programed for the Blue Ridge

Parkway in North Carolina and Virginia; Foothills Parkway in Tennessee; George Washington Memorial Parkway in Virginia and Maryland; Natchez Trace Parkway in Alabama, Mississippi and Tennessee; and Rock Creek and Potomac Parkway in Washington, D.C.

The National Outdoor Recreation Resources Review Commission was established in June 1958, by the 85th Congress to conduct a nationwide survey of the outdoor recreation resources of the nation and to develop recommendations for such policies and programs that will assure adequate quantity and quality of outdoor recreation opportunities to meet the nation's increased future population needs.

An earlier recreational study program, started by the National Park Service in 1936, to plan for the establishment of outdoor recreation areas by all levels of Government—Federal, State, and local—and accelerated under the Mission 66 program—is now tied in closely with the National Outdoor Recreation Resources Review Commission.

In the field of planning and surveys excellent progress was made during the year. Under the long-range National Park System plan, special staffs in the Regional Offices continued taking inventory of scenic and scientific resources that have primary value for park and recreation purposes. Analysis of the inventory will ultimately establish what areas possess nationally significant values and merits for possible status as units of the National Park System.

Nationwide recreation planning was concentrated on the inventory of existing recreation areas and the forecasting of future needs. About 85 percent of the inventory and evaluation of areas administered by State and local agencies was completed.

Looking into the future, to the years 1975 and 2000, good starts were made in determining the needs for park and recreation areas for those years and the potential areas with outstanding recreation resources which would fill the future needs of the National Park System.

During the fiscal year, 24 laws directly affecting the National Park Service were enacted by Congress. An outside-the-park administrative site for Yosemite National Park, was authorized at El Portal, Calif., and a suitable boundary for Everglades National Park in Florida was fixed. Authority was granted to develop and complete Jefferson National Expansion Memorial at St. Louis, Mo., according to approved plans. Grand Portage National Monument in Minnesota was authorized, and the General Grant National Monument in New York City was officially established. The Minute Man National Historic Site in Massachusetts was established by Secretarial Order. An Executive Order establishing Horseshoe Bend National Military

Park in Alabama was signed by the President on August 11, shortly after the close of the fiscal year.

The Department proposed legislation, later introduced, to preserve certain shoreline areas. If enacted, it would establish the basic principle that it is in the national interest to set aside significant portions of shore areas for this and future generations. The proposal would authorize Federal preservation of three shoreline areas possessing national significance. The Secretary of the Interior would have the authority to designate such areas.

Other pending legislation would authorize Bent's Old Fort, Colorado, Fort Bowie and the Hubbell Trading Post, both in Arizona, to be established as national historic sites; the preservation of Arkansas Post in Arkansas as a unit of the System; establishment of the Minute Man National Historical Park, Mass.; and establishment of the Chesapeake and Ohio Canal National Historical Park, Md.

The Department endorsed those proposals and, in addition, asked that Dinosaur National Monument be given the status of a National Park, and recommended legislation to provide an adequate basis for administration of the Lake Mead National Recreation Area. At the fiscal year's end the Department was giving sympathetic consideration to a recommendation that a 147,000-acre area in the Snake Range of Eastern Nevada, to include Wheeler Peak and Lehman Caves National Monument, be sought for establishment as a National Park.

River Basin and Regional Studies

Investigations continued on the recreation potentialities of the Columbia River Basin and the Delaware River Basin. The report on findings of the Missouri River Basin-Wide Recreation Survey was submitted. The report on recreation resources of northwestern California was delivered to the Pacific Southwest Field Committee for distribution.

Special assistance was provided to Hawaii on an inventory of existing and potential recreation areas. Draft reports were prepared on the recreation potential of Alaska, and assistance was given to Utah and Colorado in the formulation of plans for new State park systems.

Mission 66

Started in 1956, Mission 66, in a sense, came of age in 1959. Such a continuous, long-range program requires many preparatory steps,



Development of improved roads and parking areas under Mission 66 is none too soon as shown by this throng of visitors at Yellowstone National Park.

and must build up gradually. During the initial stage, much more energy and money are applied than can be extracted as immediate benefits.

By the end of 1959, however, with many programs and projects started in earlier years coming to maturity, the use benefits of Mission 66 assumed a dominant position. Mission 66 is now in good balance, and the effort and funds being invested in new projects and programs are equalled or exceeded by the benefits resulting from the completion of facilities and the maturing of programs that started in earlier years.

It is very important that the program maintain this equilibrium as it progresses throughout the remaining 7 years of Mission 66, not only for reasons of economy and efficiency, but to keep pace with the demands of increasing park travel as well.

Mission 66 cannot be considered apart from the full National Park Service program—they are the same. The accomplishments of Mission 66 are the accomplishments of the Service, and are detailed in other sections of this report.

The following highlights are cited both to illustrate the nature of the program and to demonstrate the advantage of long-range planning when provided with the support necessary to keep the job going on full schedule.

Lands were acquired and plans decided which will result in the removal of many administrative, operating, and employee housing structures from congested Yosemite Valley, and their relocation at El Portal, Calif., just outside the boundary of Yosemite National Park.

The basic development of Mather Village in Grand Canyon National Park, Arizona, was completed, and some of the facilities placed in use. This development will accomplish the expansion and decentralization of public use developments, and eventually effect the restoration of the natural scene on the rim proper, much as has been done at Canyon Village in Yellowstone National Park, Wyoming-Montana-Idaho.

Wilderness research projects, in cooperation with universities and specialists, were started in the Rocky Mountain and Sierra parks, to assemble knowledge supporting more effective preservation of natural and wilderness values.

The completion of new visitor use facilities in Everglades National Park, Florida, stimulated the resolution, after many years of negotiation, of boundary and land problems in this park.

The flexibility of the Mission 66 program was demonstrated as camp-ground development was stepped up in response to the very rapid increase in camping evident in the last 2 years.

Interpretation and presentation programs were greatly strengthened as 13 new visitor centers were placed in operation.

For the first time, Isle Royale National Park, in Michigan, became adequately accessible with the launching of the 96-passenger motor craft, the *Ranger III*.

With all activities moving forward and showing results, the Mission 66 staff work focused upon the internal functions of the Service, seeking ways to achieve more efficient operation, effective use of manpower, better and more rapid planning procedures, improved competence in personnel, and greater economy. In these fields, four items are especially worthy of mention:

1. Two attractive, full-color bulletins were produced, designed to invite into government service men of highest competence and quality. The first pertains to the uniformed field force—rangers, naturalists, historians, and archeologists. The second is addressed to the professions of landscape architecture, architecture, and engineering.

2. Prospectuses were prepared proposing the establishment of the National Park Service training school at a permanent location and in permanent facilities. The recruitment of highest quality personnel, and the maintenance of the highest degree of competence, are basic to good public service.

3. In order to reduce the disparity between parks to a more comprehensible and manageable basis, to provide a greater degree of consistency, uniformity, and economy of operation, and to permit more specific delineation of responsibilities and relationships, the areas administered by the Service were classified in five management groups. The organizational pattern designed for each group is consistent with the needs of the parks comprising each group, and with relationships with the Regional Offices.

4. A study of planning and management procedures resulted in a new format, new content, and new procedures for preparing Master Plans, and the scheduling of Master Plan revision for all parks over the next 3-year period. The new Master Plan will not only consolidate into one document several separate planning instruments, but will provide a sounder basis for development planning, extend the Master Plan concept into the management field, and streamline procedures for preparation and approval of this basic instrument of park administration.

Interpretation

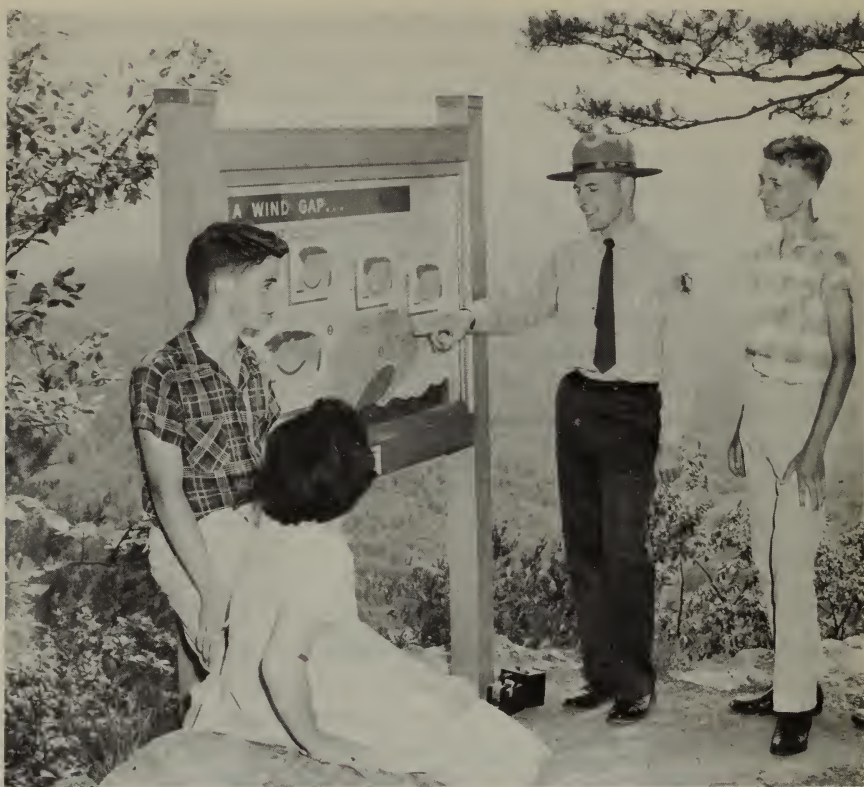
The interpretive program of the National Park Service provides an educational service on a national scale. In the 1958 calendar year, more than 58 million people visited the 181 scenic, scientific, historical and archeological and recreational areas included in the National Park System.

Visitors want to appreciate and understand what they see and ask questions that must be answered accurately and completely. To answer the questions of park visitors concerning geology, natural history, history, and archeology of the parks is the assignment of the interpretive program of the Service.

Park visitors find inspiration at Jamestown, on the Oregon Trail near Fort Laramie, or on the great battlefields of the Revolution and the Civil War. The Grand Canyon, the beautiful mountains and streams, or a wilderness area in the National Parks, gradually comes to symbolize the nation in their minds, so that the type of knowledge gained from the interpretive program of the parks promotes patriotism and good citizenship. The nature and scope of the Interpretive Program has been greatly improved and accelerated under Mission 66.

Service to the Public

To enable the visiting public to get the most out of their visits to the parks through understanding and appreciation, the Interpre-



Park historians add to the understanding and enjoyment of park visitors through talks and tours.

tive Program provides Visitor Centers for orientation, for information, and other conveniences which the visitor needs in visiting a park or historical area.

The Visitor Center usually includes a museum or exhibit space in which the story of the area can be told in an interesting and attractive manner. These are not museums in the regular sense but they display valuable specimens related to the park story and the technique of presentation is that of the museum.

Collectively these park museums, and the collections at those that have special collections, constitute one of the largest and most important museum systems in the Nation. In Independence National Historical Park, Phila., for instance, the Service has in its custody the Nation's largest collection of portraits of the founding fathers of the United States. The Jamestown Visitor Center in Virginia has an enviable collection of early 17th century objects relating to our Colonial history.

In addition to the Visitor Centers and museums, the Interpretive Program provides expert guide service, self-guiding trails, trailside exhibits, and automatic or visitor-operated audiovisual aids and devices. To make history and natural history live and to make science intriguing is also an objective of the Interpretive Program.

The number of visitors utilizing interpretive services during the calendar year 1958 increased over the preceding year's total at a rate 69 percent greater than the rate of increase in total park visitation. While the count of visitors participating in conducted trips or hearing interpretive talks by naturalists and historians remained just under 10 million, the significant advance in 1958 was in the use of self-guiding devices. Additional self-guiding facilities available in 1958 raised the total of estimated contacts through this medium to over 30 million, a gain of 20 percent. Visitor centers and other attended stations recorded a gain to a total of 20.5 million visitors.

Visitor Centers

Visitor Centers built so far under Mission 66 have proved their value in terms of increased enjoyment and appreciation of the parks. Visitors have found these multi-purpose buildings convenient, efficient places for learning quickly what to see and do during their stay in a park. During this fiscal year 13 new Visitor Centers were completed and opened to the public, and 20 more were under construction.

Among the new Visitor Centers are two that marked important anniversaries. The one at Abraham Lincoln National Historical Park, Ky., was built 150 years after Lincoln's birth. Exhibits there tell of his father and mother and their frontier life.

The Visitor Center at Theodore Roosevelt National Memorial Park, N. Dak., was completed during the centennial year of his birth. It orients people to the widely scattered features of the park and tells of the significant influence Roosevelt's experiences as a rancher in the Badlands had on his life and work.

Other Visitor Centers opened for the public were Moores Creek, Organ Pipe Cactus, Pipestone, Richmond, Yellowstone Canyon, Chaco Canyon, Fort Union, Hopewell, Carlsbad, Peaks of Otter, Cumberland Gap, and Colter Bay (Grand Teton).

Museum Program

An important byproduct of intensive work on museum records was more precise information about the historic and scientific col-

lections being preserved in the parks. There are over 2,300,000 specimens, most of them carefully selected for their value in understanding and interpreting the parks and the national historical areas. Plans were developed for a critical review of the contents of all park collections to increase their value and use.

Park collections continued to receive generous donations. At the Spanish Embassy in Washington, D.C. on October 11, 1958, the Minister of the Army of Spain presented to Under Secretary of the Interior Elmer F. Bennett, a series of early Spanish arms for use at Castillo de San Marcos National Monument in St. Augustine, Fla.

Mr. William H. Robinson, Jr. of Gloucester, Mass., presented to the National Park Service a bronze Spanish mortar and bed of about 1780. It will be mounted at Castillo de San Marcos.

The staff of museum preservation specialists applied skillful treatment to rare and valuable specimens for 28 parks. Their work included preservation of the foundation timbers of the flag pole from which the Star Spangled Banner flew during the bombardment of Fort McHenry in 1814. They also restored the celebrated Thomas Moran paintings of the Grand Canyon and Yellowstone in the Secretary's conference room, as well as important portraits

New Visitor Centers, such as shown at Cumberland Gap National Historical Park, are an integral part of Mission 66, and offer greater park understanding and appreciation through orientation exhibits, museum displays, information and other visitor facilities.



from the Independence Hall collection and from Morristown National Historical Park, N.J.

The Eastern and Western Museum Laboratories worked at full capacity and supplemented their efforts by contracts with exhibit builders, so great was the demand for exhibit preparation.

Audio-Visual Planning and Installations

Distinct progress in the audiovisual field was made during fiscal year 1959 by the Audio-Visual Laboratory. Outstanding were installations of visitor-activated repetitive motion picture projectors at Dinosaur and Craters of the Moon; the installation of four improved visitor-activated cabinet projectors elsewhere; development of a battery-operated message repeater for remotely located audio stations, and complete audiovisual installations in assembly rooms of 10 major visitor centers providing both automatic and manual presentations.

Roadside and Trailside Interpretation

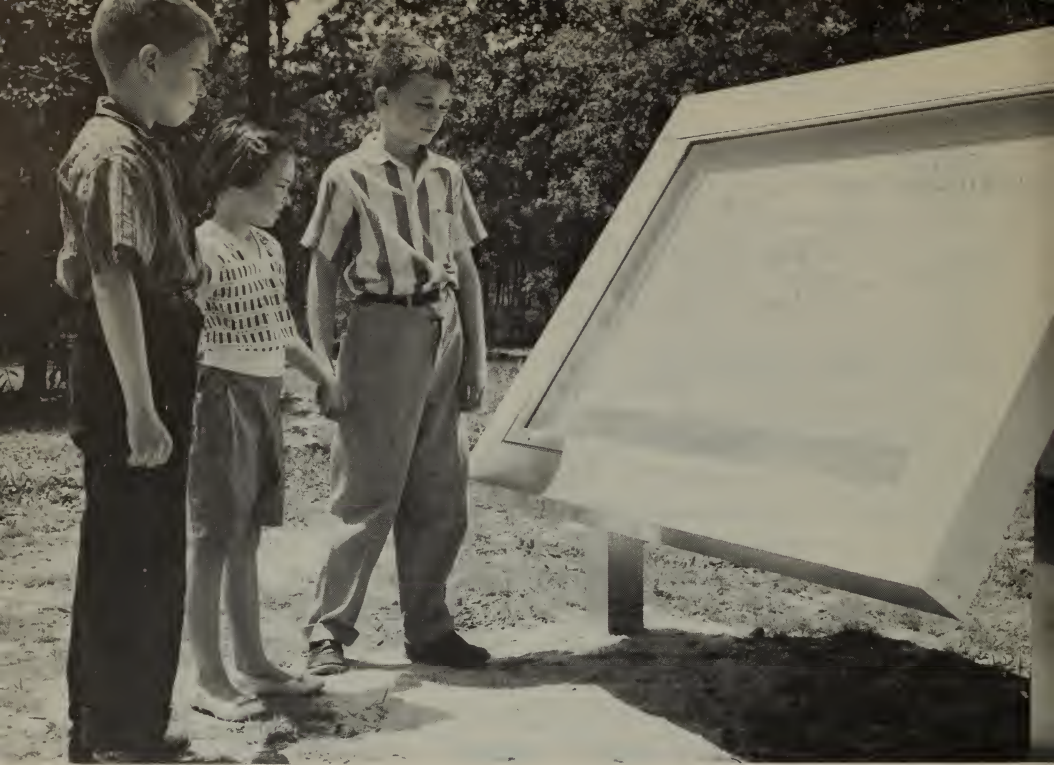
In 1959, the development of many new roadside and trailside interpretive facilities strengthened the Interpretative Program. These assist visitors who like to guide themselves, especially in heavily visited areas where the demand for guidance exceeds the park staff.

New interpretive markers were installed on the Jackson Hole Highway, Grand Teton National Park, Cades Cove and Smokemont trails, Great Smoky Mountains National Park; Arches National Monument, Beaver Dam, and the Natchez Trace Parkway.

Research

Archeological excavations within areas administered by the National Park Service were carried out in Chaco Canyon, at Montezuma Well, and at Tuzigoot. A survey of the north rim mesa in Walnut Canyon was completed and the Southern Illinois University surveyed the area south of Frijoles Canyon in Bandelier as part of a long-term research program centering on the Pueblo of Cochiti. Reports on excavations at Petrified Forest and El Morro are being prepared and an analysis of survey collections from Organ Pipe Cactus National Monument is now underway.

Archeological research in relation to construction projects was carried on at Badlands, George Washington Carver, Fort Laramie, Harpers Ferry, Independence, Fort Union and Fort McHenry. Work at Fort Frederica was completed during the year. An important project involving studies in ecology, soil analysis, palynology



Wayside exhibits, such as this one of the Battle of Moore's Creek in North Carolina, aid young and old in understanding the significance of our Nation's history.

and geochronology as well as archeology was begun at Wetherill Mesa in Mesa Verde under the cosponsorship of the Service and the National Geographic Society.

The extensive salvage archeology program conducted by the National Park Service through financial cooperation with other Federal agencies and State and local institutions is being continued in the Missouri River Basin where several Smithsonian Institution crews were in the field. In the Upper Colorado River project the University of Utah, the Museum of Northern Arizona and the Museum of New Mexico cooperated with the Service in survey and excavation work in the Glen Canyon and Navajo Reservoirs.

Several projects are under way in Texas through cooperation with the University of Texas, such as the Diablo and Cooper Reservoirs. Work continued in the Dalles and John Day Reservoirs in Washington and Oregon, while excavations were carried on at Hartwell in Georgia, Walter F. George in Alabama, and numerous small areas in the eastern United States.

In natural history, geological research is continuing in cooperation

with the Department's Geological Survey in several areas involving glaciology and geological mapping. Additional glacier studies are being conducted at Olympic and Glacier Bay as part of the International Geophysical Year program in cooperation with the American Geological Institute. Other cooperative research in progress includes geological studies at Cape Hatteras and Virgin Islands, and stratigraphic mapping at Badlands. The Service also is continuing the hydrothermal studies at Yellowstone initiated last year.

The Service initiated biological research on bighorn sheep at Death Valley and Dinosaur, and cooperative studies on the elk in Jackson Hole, Wyo. Research was begun on the wolves and moose of Isle Royale in cooperation with Purdue University; and grizzly bear studies at Mount McKinley, carried forward by the University of Alaska. Studies on the fragile alpine environments at Sequoia, Rocky Mountain, and Grand Teton continued. Marine fishery research progressed at Everglades and Virgin Islands, and the Department's Fish and Wildlife Service continued work on trout at Yellowstone, Rocky Mountain, Shenandoah, and Great Smoky Mountains.

Historical and architectural research on the Assembly Room of Independence Hall, Congress Hall, and Old City Hall and at Harpers Ferry continued. Historical research at Fort McHenry was brought to a conclusion with many fruitful results.

Important historical research was undertaken on Booker T. Washington and George W. Carver. A major study of the history of the site of Federal Hall, first Capitol of the United States, was completed.

National Survey of Historic Sites and Buildings

The National Survey of Historic Sites and Buildings, reactivated under Mission 66, continued to show good progress. The following studies were completed: (1) Theme IV, Spanish Exploration and Settlement; (2) Spanish Colonial Sites in the Panama Canal Zone; (3) Theme V, French Exploration and Settlement; (4) Theme XI, Advance of the Frontier, 1763-1830; (5) A Special Study of the Lewis and Clark Expedition; and special studies of other phases of our Westward Expansion, namely (6) The Santa Fe Trail, (7) The Hubbell Trading Post, and (8) The Mining Frontier.

Wildlife

Special emphasis was given to utilizing the knowledge gained from wildlife research in the interpretive programs of the parks. In-

creased attention was given to the interpretation of fishes in their natural habitats. The fascinating marine life in the waters of Virgin Islands was featured.

Other examples showing the wide variety of opportunities afforded in this field by the National Park System are the wolves of Isle Royale, the desert bighorn sheep of Death Valley, and the gray whales which migrate in view of thousands of visitors at Cabrillo National Monument in California. The expanding research program on biological resources promises to provide a great wealth of information for public education and enjoyment as well as facts needed for the conservation of these important resources.

Staffing

The National Park Service—with its almost 60 million visitors seeking instruction in outdoor laboratory courses in history, geology, natural history and archeology—must have an adequate staff not only to give answers directly or to conduct guided trips, but to plan the museum story and trailside exhibits. In 1958, the interpretive professional staff numbered about 120 historians, 95 naturalists, and 37 archeologists. To cope with the increased responsibilities of the interpretive program under Mission 66, 12 new permanent naturalist positions were established during the year; 12 new historians and 7 new archeologists were employed.

Archeology, which since 1935 had been incorporated within the Branch of History, was established as a separate Branch of Archeology. The staff of the Museum Branch was increased by three.

Memorial Commission Activities

The National Park Service serves as the fiscal and cooperating agency for the Civil War Centennial Commission, Lincoln Sesquicentennial Commission, Boston National Historic Sites Commission, and the Hudson-Champlain Celebration Commission.¹

The Civil War Centennial Commission with headquarters at 700 Jackson Place, Washington, D.C., held its annual meeting April 15–16 in Richmond, Va. The Executive Director and Chairman met frequently with State commissions in planning for the centennial observances. The National Park Service collaborated with the Commission in producing a film on "Planning for the Centennial of the Civil War."

The Abraham Lincoln Sesquicentennial Commission, scheduled to function until March 1, 1960, sponsored or cooperated in many observances including a joint session of the Congress on February

12, when Carl Sandburg was principal speaker, a redesign of the Lincoln Penny, and an issue of four special stamps. Its secondary school program will reach 97 percent of the high schools in the United States, public, private, and parochial. It also has an active college program. *Lincoln Day-by-Day*, a four-volume work on his activities, is in the process of preparation for publication.

The Boston Historic Sites Commission completed a major portion of its studies on the preservation and interpretation of Colonial and Revolutionary historic sites in Boston and vicinity by the issuance of the Lexington-Concord Battle Road Report, published as House Document No. 58, 86th Congress. The final report of the Commission covering sites in Boston proper will be completed in 1960.

The Hudson-Champlain Celebration Commission, with headquarters in Federal Hall, New York City, was established by act of Congress, August 8, 1958. The Chairman has a commission of 21 members who have sponsored or will sponsor appropriate observances in New York, New Jersey, Vermont, and Canada, throughout the spring, summer, and fall months.

Information and Publications

Growing public interest in the great recreational, educational and patriotic assets contained within the National Park System was reflected throughout the year by mounting requests for informational publications and factual reports.

Although some 12,000,000 free informational publications were produced and about 500,000 were sold by the Government Printing Office, demand exceeded supply.

The thirst for knowledge about the National Parks, Monuments and historic areas was worldwide. During the year requests were received from citizens of 58 foreign countries for National Park Service informational publications.

Although the great bulk of park publications are distributed in the parks themselves, some 55,000 mail inquiries for park information were received in the Washington office.

Handbooks on the historical significance and natural history of park areas and reports on the scientific findings of researchers supplemented the free informational program. Two new handbooks—Guilford Courthouse National Military Park, and Chalmette National Historical Park—were added to the handbook series during the year. A revised edition of the Saratoga National Historical Park handbook was issued and a handbook on tree bracing was revised and reissued.

Through many press releases, the public was kept informed of the progress of Mission 66 and other park matters of national interest. Individual assistance was provided to magazines, newspapers, radio and television stations, and motion picture companies in the preparation of materials concerning the parks.

Division of Ranger Activities

Throughout the past year, the Park Rangers successfully met their dual responsibility of serving as friend and protector to millions of visitors and as protector of the parks and the scenic, scientific, and historic values they contain. Their work cannot be performed within the schedule of an 8-hour day or 40-hour week and Park Rangers continued to work many additional hours compensated for only through the satisfaction that comes from serving and helping others. Public recognition and appreciation of their efforts was evidenced by the large number of complimentary letters that were received by the Service from visitors whom they had helped.

The new Division of Ranger Activities in the Washington Office completed its first full year of operation. Good progress was made in the development of much needed policies and policy guidelines covering important activities of Park Rangers. These included policy statements on law enforcement and mountain climbing.

A joint conference of Chief Rangers and Interpreters was held in Washington, D.C., during March. This is the first such conference ever held that included the participation of every Chief Ranger in the Service. It provided an excellent opportunity to study and discuss the full scope of Ranger Activities as they are found throughout the entire National Park Service.

Of growing concern to Rangers in the larger, more heavily used parks, is the proportion of their available time now required to conduct protection and visitor service activities in the developed areas and along park roads. This situation has resulted in too little time left to regulate and control the increasing public use of the back country and to protect park values found there.

During the year a task force of field employees was called to Washington where they studied Service uniform regulations, made recommendations for revisions needed to effect a higher degree of standardization, better appearance, and prepared a handbook outlining how the uniform should be worn and maintained.

The National Park Service Training Center at Yosemite National Park completed its second year of highly successful operation.



The awe-inspiring majesty of nature draws millions of Americans to our parks annually.

During the year, the Arno B. Cameron and Newton B. Drury Sessions were held which provided 51 young men in their first year of employment with Service orientation and indoctrination together with some training in work techniques and skills. A young forester from Turkey, sent to this country by his Government to study national parks and forestry, attended the fall session of the training center.

Park Travel

The upward trend in park attendance was cyclically interrupted in calendar 1958 when total visits declined 1 percent to 58,677,000 from 1957's 59,285,000. Resumption of the upward curve was clearly evident during the second half of fiscal year 1959.

The collection of travel statistics and the analysis of public use has been reoriented toward measurement of park workload and determination of development priorities, staffing requirements, design-load estimates, and need for services.

Mountaineering

The National Parks in the mountains of the West, and in Alaska, draw upon the hardy spirit of about 20,000 visitors annually who seek out the rugged summits for physical accomplishment.

Search, rescue, or evacuation missions were incident to five fatalities and 20 other accidents with potentially serious consequences.

The 3,600 foot face of El Capitan in Yosemite National Park was climbed by a group of expert mountaineers on November 12 after about 45 days of effort expended at various times from a start made in July 1957.

On July 2, two parties made the first successful ascents of Mount McKinley National Park, Alaska, since 1954.

Boating

The full force of power boating is felt on park waters and the need has arisen to study closely this popular form of use to determine the degree of protection and control necessary to conserve the water-related resources and prevent injuries or deaths.

Winter Use

The Everglades, Hawaii, and Virgin Islands offer respite from the cold in warm waters under tropic skies. Rainier, Yosemite,



Many national parks offer spectacular views and are centers for water activities including boating, fishing, and water skiing.

Olympic, or Rocky Mountain with a cover of snow and frosty brightness bring opportunities for family participation in and appreciation for outdoor activities and scenic splendor. Yearlong in these parks and in Great Smoky Mountains, Hatteras, Blue Ridge, or Sequoia people by increasing numbers are finding inspiration and refreshment.

Camping

In 1958, camping pursued its strong upward movement. It rose 11 percent from 4,201,000 camper days in 1957 to 4,665,000 in 1958. Campgrounds have been burdened beyond capacities, but this appropriate and beneficial experience in the parks brings enjoyment to many that could be provided in no other way. Small travel trailers are growing in camper preference over tents.

Wildlife and Fish Management

This was the first full year that management responsibilities in wildlife conservation has been a function of the Division of Ranger Activities. To consider questions in management biology, 59 Wildlife Rangers were designated by the Superintendents, and more than a dozen reports on fish and wildlife management have been

received. With assistance from cooperating agencies, wildlife reductions were made at Glacier, Mammoth Cave, Yellowstone, Grand Canyon, and Rocky Mountain.

Fish were planted in 13 areas, and in an attempt to reestablish bighorn sheep, five were released at Theodore Roosevelt National Memorial Park.

Grazing

Each year for the past several years there has been a light decrease in open-range use by domestic livestock in the western national parks and monuments. This trend continued in 1958. The elimination of this land use will not be realized until the distant future because of the life tenure of many of the permittees. However,

Below: A striking example of Mission 66 activities in improving the parks for the enjoyment and inspiration of this and future generations. This picture shows the falls in Yosemite Valley marred by an unsightly old building. *Opposite page:* The building has been removed, allowing for an unobstructed natural view of the spectacular falls.





progress is being made in eliminating livestock from public use areas through the media of fencing.

Forest Fire Control

The Servicewide fire record for the year was generally a most successful one. The 333 fires which originated inside or entered park boundaries were below the previous 5-year average of 339, and the 1958 burn of 3,770 acres was less than any year reported during the previous 10 years.

The 1958 record of 209 lightning-caused fires and 124 man-caused fires is significant for usually fires caused by man's carelessness exceed those started by lightning. Approximately 3,000 men devoted more than 91,000 hours on fire suppression activities.

White Pine Blister Rust Control

Initial eradication of ribes (wild currants and gooseberries), the alternate host of the disease, has been completed on 94 percent of the 375,404 acres included in control units. Eight-one percent of the control area in 14 areas administered by the National Park Service now only require infrequent workings in order to maintain a "ribes free" or maintenance status.

Recreation Resource Planning

Special staffs in the Regional Offices are taking inventory of scenic and scientific resources that have primary value for park and recreation purposes. Preliminary analysis of the data is being made to identify areas that possess nationally significant values and merit consideration for possible status as units of the National Park System. Based upon the initial inventory and evaluation, plans are being drawn for comprehensive investigations of desirable and suitable areas.

Forest Pest Control

Forest insect and disease conditions were generally less severe in the parks and monuments this year and maintenance control projects were successful in keeping losses from most pests at a minimum. The most destructive outbreaks were the continuing Southwestern pine beetle infestation at Bandelier National Monument and the mountain pine beetle attack associated with the lodgepole needle-miner infestation at Yosemite National Park. Spraying developed

and applied in and near the public use area at Bandelier appears to have been unusually successful. Mountain pine beetle control work has been continued at Yosemite National Park in conjunction with the intensive research program of the Department of Agriculture's Forest Service under way there to develop a successful control for lodgepole needleminer now attacking over 50,000 acres within the Park.

New Areas Established

In accordance with authorizing legislation, the General Grant National Memorial, N. Y., was officially established by acceptance on May 1, 1959, of the deeds transferring the property from the Grant Monument Association to the United States.

The 8-acre Minute Man National Historic Site, Mass. was established by Secretarial order on April 14, 1959. Deeds to lands donated for Horseshoe Bend National Military Park, Ala., were accepted by the United States, and an Executive order establishing the Park was signed early in fiscal 1960.

The possibility of preserving a representative portion of the tall grass or true prairie in Pottawatomie County, Kans., as a unit of the National Park System is being considered by the Department. This proposal culminates several years of study by the National Park Service of remaining portions of the tall grass prairie. Similar studies are in progress to determine what possibilities remain to preserve examples of the important short grass or mixed prairie. Definitive studies of the national park potentialities of the Snake Range in eastern Nevada were completed and are being considered by the Department.

Boundary Adjustments

During fiscal year 1959, the 85th Congress authorized boundary adjustments which included additions of lands at Cape Hatteras National Seashore Recreational Area, Cowpens National Battlefield Site, Gloria Dei Church National Historic Site, Independence National Historical Park, and Isle Royale and Yosemite National Parks; a small deletion of lands at Sequoia National Park; and both additions and deletions at Everglades and Kings Canyon National Parks. Legislation was also enacted which authorized boundary changes at Vicksburg National Historical Park, Hot Springs National Park, Natchez Trace Parkway, and Death Valley National Monument. Additions to Cabrillo, Capitol Reef and Fort Pulaski National Monuments and Independence National Historical Park were accomplished by Presidential proclamations.

Bills introduced in the 86th Congress would authorize boundary adjustments at Independence National Historical Park; Fort Donelson and Kings Mountain National Military Parks; DeSoto and Wright Brothers National Memorials; Devils Tower, Dinosaur, Edison Laboratory, Fort Vancouver, and Montezuma Castle National Monuments; San Juan National Historic Site; and Mount Rainier and Zion National Parks. Another bill would permit use of Federal funds to acquire lands at Antietam National Battlefield Site.

Officials of the McGraw-Edison Co. have offered to donate Glenmont, the home of Thomas A. Edison in West Orange, N. J., to the United States for preservation with the Edison Laboratory, established as a National Monument in 1956. Negotiations are now under way looking toward inclusion of the Edison Home in the National Monument.

Advisory and Consultative Assistance

Forty-six States, Hawaii, and Puerto Rico were furnished assistance on 426 occasions on a wide variety of problems. Of special significance is the assistance furnished by the Interpretive Specialist who was assigned to the branch in the spring of 1958. He has provided interpretive planning assistance in 12 States on 20 occasions, including major projects currently underway in Georgia, Maryland, Michigan, South Carolina, West Virginia, and in Breaks Interstate Park in Kentucky and Virginia. Additionally, he has surveyed interpretive programs in 95 State and local areas in 25 States. There is evidence that State and local park authorities are becoming increasingly interested in interpretation.

Cooperation was extended to the National Conference on State Parks in a study which was published by the Conference under the title Revenue Bonds for State Park and Recreation Area Development—Report on Their Use and Features. This 26-page report with 77 pages of appendices discusses the advantages and disadvantages of this method of financing and gives an account of the programs in 12 States.

Real Property Disposal

Thirty-three Federal surplus properties totaling 2,095 acres were recommended to General Services Administration for conveyance to the States and their political subdivisions for park, recreation, and historic monument purposes. The Service now has responsibility

for enforcing compliance with the conditions of the deeds on a total of 145 properties involving 24,383 acres.

Recommendations were furnished to the Department's Bureau of Land Management on 54 applications from State and local agencies to acquire public-domain lands for park and recreation purposes.

Park Practice Program

The program of exchanging park administration practice and ideas continues to grow. Every State now participates and many municipal, county, and regional park authorities, as well as private park and recreation organizations, colleges and universities, and a number of foreign nations are contributing ideas and participating. Municipal and other agencies now comprise more than 40 percent of participant membership; foreign participation has doubled during the past year. Total membership in the full program now exceeds 750, an increase of 25 percent.

Much of the material presented through the three publications of the program—Design, Guideline, and Grist—are being quoted in other publications and are being used as training materials in universities offering courses in park administration.

State Park Statistics

The 1958 edition of this annual publication produced in fiscal 1959 shows that there are 2,335 State parks and related types of recreation areas embracing 5.4 million acres; that attendance exceeded 237 million, including 17 million overnight visitors; that the States spent \$47 million for operation and maintenance and \$26 million for capital improvements; and that they employed 6,691 year-round and 9,982 seasonal employees. Perhaps the most significant revelation is the use by 13 million campers, an increase of 24 percent.

Nationwide Recreation Planning

The work on nationwide planning for nonurban recreation resources was concentrated on the inventory of existing recreation areas and the forecasting of future needs. Inventory and evaluation of areas administered by State and local agencies was about 85 percent completed. Work is underway to determine the quantitative requirements for parks and recreation areas for the years 1975 and 2000 and to inventory potential areas having outstanding recreation resources.



Thundering surf at Acadia National Park, Maine, brings welcome relief and relaxation from the tensions of present day city life.

Seashore Surveys

The Pacific Coast Recreation Area Survey was published. Distribution of the report aroused considerable interest.

Field studies were completed on the Great Lakes Shoreline Survey.

River Basin and Regional Studies

Investigations continued on the recreation potentialities of the Columbia River Basin, in cooperation with the Recreation Subcommittee of the Columbia Basin Inter-Agency Committee, and the Delaware River Basin, where draft reports were being prepared on portions of the States in the Basin, in cooperation with State agencies. The report on the Missouri River Basin-Wide Recreation Survey was printed, and the report on recreation resources of northwestern California was delivered to the Pacific Southwest Field Committee for distribution.

Special assistance was provided to Hawaii on an inventory of existing and potential recreation areas, and preparation of a plan for a system of parks; draft reports were prepared on the recreation potential of Alaska; and assistance was given to Utah and Colorado in the formulation of plans for new State park systems.

Reservoir Development and Management

Work carried on under the provisions of section 8 of the Colorado River Storage Act included installing an acting superintendent for

the Glen Canyon National Recreation Area project, opening a temporary project office at the Wahweap public use development site, preparing preliminary master plans for two major public access points at the future Flaming Gorge Reservoir and for the Navajo Reservoir area, and undertaking negotiations for administration of recreation resources of the Navajo Reservoir.

Recreation reports prepared included general development plans for 14 reservoir projects, reconnaissance or planning reports for 5 projects, annual field review of 36 reservoir recreation areas, and special studies of recreation use of 2 reservoir recreation areas. Management agreements were negotiated for operation and maintenance of 10 reservoir recreation areas.

Recreation Research

Special studies being made under contract for the Service included (1) a study to provide information on present and future needs for organized camping facilities to provide camping opportunities for children and young people and (2) the initial stages of a study for evaluation of the economic and sociological effects of recreation use of three reservoirs in the Missouri River Basin.

Plans were made for nationwide sample interviewing for contract survey work on the extent of interest in nonurban outdoor recreation generally and in types of activities requiring publicly owned recreation space and facilities in order to help measure long-term demand for public parks and recreation areas and the types of outdoor-experiences that are sought.

Administration

For the third consecutive year under Mission 66, the Service's financial position was strengthened in 1959 through appropriation increases. There follows a comparison of the 1959 appropriations with those for 1958:

Appropriation item	1958 fiscal year	1959 fiscal year	Increase (+) or decrease (-)
Management and Protection.....	\$14,527,094	\$16,056,200	+\$1,529,106
Maintenance and Rehabilitation of Physical Facilities.....	11,663,786	12,477,100	+\$813,314
General Administrative Expenses.....	1,390,650	1,429,300	+38,650
Construction.....	17,400,000	20,000,000	+2,600,000
Construction (Liquidation of Contract Authorization).....	31,000,000	30,000,000	-1,000,000
Total Cash Appropriations.....	75,981,530	79,962,600	+3,981,070
Construction (Amount by which Roads and Trails and Parkways Contract Authorization exceeds or is less than cash appropriation).....	+15,765,500	-12,765,500	-28,531,000
Total New Obligational Authority.....	91,747,030	67,197,100	-24,549,930

The net decrease in new obligational authority was brought about by the advancement of 1959 fiscal year contract authorization for roads and trails and parkways construction totaling \$14,765,500 for obligation during the latter part of 1958. This advance enabled the Service to get a significant portion of its 1959 roads and trails and parkways programs under way prior to commencement of the fiscal year. Disregarding this adjustment, new obligational authority for the 1958 fiscal year totaled \$76,981,530 and for 1959 it totaled \$81,962,600, making a total increase of \$4,981,070.

Improvement in Financial Management

Progress in the prosecution of the Service's plan for improvement in financial management continued throughout the year. The most significant achievement in this connection was the implementation of the plan and procedures for placing all of the Service's fixed assets under accounting control. This project, which includes inventorying and estimating the cost of all fixed assets acquired or developed prior to 1956, when the new accounting system was installed, was progressing at the close of the fiscal year and will be completed in 1960. Also at the close of the fiscal year, the Accounting Handbook was complete in draft form and ready for final review.

Personnel

The volume and complexity of personnel work continued the steady rate of increase that has been evident since the inception of Mission 66. To meet the demands of efficient and effective operation with comparatively little increase in staff, further delegation of personnel management authority to field officials was found necessary and feasible. Increased delegation of authority to Regional Directors and the Superintendent of National Capital Parks was effected, together with decentralization of personnel folders. This raised the delegated authority to the field from GS-11 to GS-13, with the exception of Superintendent positions. This also permitted a reorganization in the Branch of Personnel, resulting in a strengthened Employee Relations staff responsible for functions previously performed by two sections and in the streamlining of operations in the Appointments and Records Unit.

Merit Promotion Program

The Service's promotion program was revised to meet the requirements of the Civil Service Commission's and Department's new Merit Promotion Program.

Employee Relations

Director Wirth was one of 10 recipients of the Career Service Award for 1959 presented by the National Civil Service League in Washington, D.C.

The Service's recommendation of a Conservation Service Award for Dr. and Mrs. Harold S. Colton of the Museum of Northern Arizona was approved by the Secretary.

There was increased activity in the suggestion and superior performance phases of the Incentive Awards Program.

Employment

The Mission 66 Staff and the Branch of Personnel developed two attractive recruitment brochures, one for the uniformed services and the other for the design professions.

Classification and Wage Matters

Revised classification standards covering park naturalist positions were developed and approved by the Civil Service Commission.

Necessary position classifications were completed in connection with the establishment of the new Branch of Archeology.

A significant development in wage administration was the enactment of Public Law 85-872, which requires that wage rate increases be made effective within certain time limits after a wage survey is ordered. The new Supervisory Pay Plan, which was released by the Office of the Secretary in August 1958, was installed.

Career Development

As a part of the Service's Management Development Program, two Management Development Seminars for National Park Service managerial personnel were conducted during the past year.

The Branch helped arrange and conduct the Twentieth General Administration Training Course, held at the Region One Office in Richmond, Va., in March 1959, for selected employees regarded as

having potential for growth and development in administration. The Nineteenth General Administration Training Course was held in the Region Four Office in San Francisco, Calif. in October 1958.

Property and Records Management

Handbooks were prepared on contracting and procurement, and property management, and will soon be distributed to the field. Substantial progress continues in establishing adequate records and inventories of museum specimens. A Quarters Subsistence and Services Handbook was produced and distributed. At Yellowstone National Park an experiment is being tried in operating a self-service storehouse for perishable foodstuffs with a view to increasing efficiency and economy. If successful, the system will be extended to additional items and other parks.

Records Management

It was a progressive year in paperwork management. The Records Management Section participated in Records Management Workshop conferences conducted by the Department. A Directives Management Handbook was written establishing an integrated directives system. A Forms Management Handbook was written extending the forms program to the field. A listing of all Bureau forms, with reference to the directive for each form, was published, resulting in the elimination of 51 forms. Two workshops, Form Improvement and Records Disposition, are being given Servicewide. Handbooks being written at the year's end include Correspondence Procedure; Reports Management; Files Management; and Records Scheduling and Disposition.

Safety

The Branch of Safety is making every effort to further organize and develop a more effective safety program to cover not only National Park Service employees and operations but visitors, concessioners' and contractors' employees and operations.

Visitor-Accident Fatalities

The visitor-accident fatality rate was reduced 16.3 percent. This is the third year in succession in which the fatality rate has been



Park views leave unforgettable memories to millions of visitors.

under one per million visitors. In 1958 there were 36 visitor fatalities which resulted in a ratio of 0.61 per million visitors, the lowest rate in the 12 years that such reports have been compiled. Of the 36 fatalities, 17 were drownings and 12 resulted from motor vehicle accidents.

Bear Incidents

Thirty-nine persons were reported having been bitten or scratched by bears during the 1958 season. This compared with 91 reported for the 1957 season, 109 in 1956, and 76 in 1955. Bears were responsible for 117 property damages during 1958 as compared to 126 in 1957, 106 in 1956, and 112 in 1955.

Motor Boat Activities

As a result of the Federal Boating Act of 1958, safety codes as applicable to motor boat operations in parks are being developed. Also, in cooperation with the Coast Guard Auxiliary, safety instruction courses are being set up in parks where motor boating is a major activity.

Safety Committee

Practically all of the areas administered by the National Park Service either have active safety committees or someone of the staff designated to handle safety program activities. The Region Three Office organized and conducted the first Bureau safety seminar at Grand Canyon National Park, with excellent results. The first meeting of the National Park Safety Planning Committee submitted recommendations for improving the Service's safety program.

Operations

The year was marked by continued progress in providing additional public accommodations and improved services in the parks and by substantial gains in acquiring lands needed for park purposes. In addition, programming methods and procedures have been improved and the increased maintenance responsibilities resulting from facilities provided under Mission 66 are necessitating a "new look" at maintenance practices and techniques. It is believed that the results achieved will contribute materially to making the National Park System more enjoyable for the increasing number of visitors each year.

Public Works Planning

Meetings of the Departmental Public Works Planning Committee were attended to discuss methods of initiating and administering a public works program in event of a National Emergency. It developed that the Service could contribute by producing a program of park projects within a thirty day period based on the Mission 66 Control Schedules. A program of projects which could be started within a twelve month period was prepared based on these schedules and on information received from the field. This program was submitted to the Committee.

Mission 66 Control Schedules

The Mission 66 Control Schedules for park developments were revised to reflect the addition of new areas, additional facilities needed to accommodate an estimated additional 10 million visitors during the Mission 66 period, and increased costs since the last submission.

Advance Development Programs

To further facilitate the crystallization of ideas on the numerous details connected with development it was decided to prepare detailed annual programs for an additional year beyond the budget year, for a total of 3 years instead of 2. These data provide the basis for orderly sequence of development; for detailed studies of individual projects; for obtaining survey data and for the preparation of preliminary plans. Each of these annual programs is tentative when first compiled, becomes progressively firmer as studies develop and is well established when due for submission with the annual estimates.

Maintenance

Maintenance and operational responsibilities of park staffs continue to increase at a rapid pace as additional facilities are completed under the construction phase of Mission 66. The increase is not only in numbers but more significantly is caused by the added complexity of the problems, particularly in respect to buildings and utilities which incorporate in their design many new materials and equipment requiring a wide variety of new maintenance practices, procedures and techniques.



New cottages for the use of park visitors are constantly being added to the Park System by private industry under Mission 66.

The season in many parks has been materially extended by keeping the roads open later in the fall and opening them earlier in the spring. In other parks additional roads are being kept open on a year-round basis. Operational efficiency in snow removal has been further improved by the acquisition of modern equipment.

Concession Authorizations

Sixteen concession contracts were negotiated. These included construction programs for Shenandoah, Yosemite El Portal administrative site, and Glen Canyon National Recreation Area, representing investments totaling about \$2.75 million dollars. Highlights in this field were the conclusion of contracts with the District of Columbia Armory Board for the construction and operation of a stadium on the East Capital Street site, and the Virginia Sky-Line Co., Inc., providing for a \$2-million improvement program at Shenandoah National Park.

Prospectuses

Nine prospectuses were issued soliciting offers for the operation of facilities at Lake Mead, Mount Rainer, Hot Springs, Canyon de Chelly, Rocky Mountain, and Great Smoky Mountains. Authorizations have been negotiated as a result of the prospectus for Great Smoky Mountains and Glacier Basin saddle livery at Rocky Mountain, and offers have resulted from the Lake Mead and Mount Rainier prospectuses.

Concessioners' Improvements

The Yosemite Park & Curry Co.'s new Village Store, restaurant and other structures, costing about \$800,000 were dedicated on May 9, and the new warehouse and utilities buildings were completed at a cost of about \$700,000. Degnan, Donohoe, Inc., also completed its new restaurant and delicatessen at an approximate cost of \$750,000. Completion of these structures allowed removal of the Old Village building complex and restoration of the area to its natural condition. In addition, concessioner improvement programs were completed at Big Bend, Crater Lake, Bryce Canyon, Everglades, Glacier, Grand Canyon, Grand Teton, Hot Springs, Mammoth Cave, Mount McKinley, Sequoia, Shenandoah, and Yellowstone National Parks; Black Canyon of the Gunnison, Canyon de Chelly, Death Valley, and Petrified Forest National Monuments; Blue Ridge Parkway; Cape Hatteras National Seashore; Lake Mead National Recreation Area;

and National Capital Parks, with investments totaling approximately \$2,500,000.

Other Concession Activities

Because of widespread opposition to the plan to remove concession facilities from the East Side of Rocky Mountain National Park, a study was made resulting in recommendations, approved by the Assistant Secretary, that certain facilities be retained.

A committee consisting of representatives from each Regional Office, and a concessioner and park employee from each Region, has been established to study the Service souvenir policy.

An arrangement was completed with the Eastern National Park and Monument Association for the operation of the Jamestown Glasshouse interpretive exhibit through a joint cooperative agreement.

Land Acquisition

During the year \$2,400,000 was made available for land acquisition, of which \$900,000 was donated. Some 78,816.98 acres of inholdings were acquired by purchase, donation, transfer or exchange.

Donations of land included: 4,000 acres from the State of North Carolina for Cape Hatteras National Seashore; 2,040 acres from the State of Alabama and the Alabama Power Co. to comprise the Horseshoe Bend National Military Park, Ala.; and the Grant's Tomb site of 0.76 acres from the city of New York and the Tomb structure from the Grant Monument Association to comprise the General Grant National Memorial, established on May 1, 1959.

The Minute Man National Historic Site, designated as such by Secretarial order, April 14, 1959, comprises 8.08 acres of U.S. land transferred from the Laurence G. Hanscom Air Force Base.

Completed purchases and approved options cover some 7,155 acres in Glacier, Grand Teton, Lassen Volcanic, Rocky Mountain, Virgin Islands, and Yosemite National Parks; Badlands, Effigy Mounds, Joshua Tree, Muir Woods, Petrified Forest, and Whitman National Monuments; Fredericksburg, Gettysburg, and Shiloh National Military Parks, Independence National Historical Park; Cape Hatteras National Seashore; and Theodore Roosevelt National Memorial Park.

At Everglades National Park, the United States conveyed 51,000 acres of land and water to the State of Florida and received in exchange 100,741 acres, a net addition of 49,741 acres of land.

Water Resources and Water Rights

Two regional units were established, thus giving four of the five regional offices basic water resources and water rights organizations for operation under delegated authority. The Department's Geological Survey investigated water resources in 16 parks and monuments to find ground water supplies or define water rights. Three similar investigations were made under contracts. Two parcels of land were purchased with wells or well sites, and 70 exploratory and test wells were drilled. Two water rights were licensed, approximately 25 extensions of time in which to make proof were obtained, and public hearings were held on two water right cases. Surveys and analyses were continued to obtain water right data for appropriative water claims.

Design and Construction

In fiscal 1959, \$43,682,832 were available for the construction programs of the National Park Service, including carry-over balances from fiscal 1958. By June 30, 85.8 percent of these funds had been obligated, and four hundred twenty-one individual construction contracts were awarded. A large number of day-labor projects also were completed. To help offset the shortage of design office personnel, a number of contracts for professional architectural and engineering services were consummated.

Roads and Trails

Major road projects completed during the fiscal year amounted to 117 miles of reconstruction or new construction at a cost of \$8,151,000. Projects totaling \$5,852,560 were started during the year and an additional \$8,635,000 was obligated prior to the start of the fiscal year under advance contract authorization. This \$14,487,560 for new projects added to the \$5,008,000 of previous years projects which are approaching completion gives a total of work under construction of \$19,495,560.

Completion of the final stages on three park routes—the Jamestown Tour Road of 4.6 miles in Colonial National Historical Park, the Heart O'Hills Road of 6 miles in Olympic National Park and the 9.2 mile entrance road at Arches National Monument—opened 20 miles of new roadway to the public. Reconstruction projects covering 227 miles of roadway and bridges were also completed.

The major projects placed under contract during the year were: Construction of the Thornton Gap Interchange and approaches at Shenandoah National Park; reconstruction of 1.679 miles of Union



The ever-increasing number of visitors often taxes campgrounds beyond their capacity. The "No Vacancy" sign directs campers to other sites in the area where they may pitch their tents. Mission 66 is designed to alleviate congestion caused by years of earlier park neglect.

Avenue at Vicksburg National Military Park; 6.5 miles of the Entrance Road at Mesa Verde National Park, 13.7 miles of paving on the Lassen Peak Highway at Lassen Volcanic National Park; 1.5 miles of reconstruction on the South Entrance Road at Zion National Park; 4,198 miles of reconstruction on the Jackson Lake Road at Grand Teton National Park; and the construction of grade separations on 14th Street and the Mall in the National Capital Parks in Washington, D.C.

Minor roads and trails projects totaling approximately \$4,500,000 were started. A few of the larger projects under contract for construction are the Bodie Island Entrance Road at Cape Hatteras National Seashore Recreational Area, amounting to \$377,179; a grade separation, structure and connecting roads, amounting to \$393,275, at Cumberland Gap National Historical Park, a parking area for the new Visitor Center, in the amount of \$155,668 and the Tour Loop Road amounting to \$260,690 at Saratoga National Historical Park.

During fiscal 1959, approximately 120 projects were under contract on minor roads and trails. An additional 5,300 vehicle parking spaces were gained during the year.

Parkways

The 1959 fiscal year again saw the National Parkways program continue at a high rate of construction on the Blue Ridge, Natchez

Trace, Foothills and George Washington Memorial Parkways. The work was concentrated on closing gaps of Parkway construction and to provide additional visitor facilities along the completed sections. A \$16 million contract authorization was provided by the Federal-Aid Highway Act of 1958, of which \$6,264,600 was programed to the Blue Ridge Parkway in North Carolina and Virginia; \$1,000,000 for Foothills Parkway in Tennessee; \$2,858,600 for George Washington Memorial Parkway in Virginia and Maryland; \$5,260,300 for Natchez Trace Parkway in Alabama, Mississippi, and Tennessee; \$216,500 for Rock Creek and Potomac Parkway in the District of Columbia and \$400,000 for advance planning.

The third year of Mission 66 also saw the largest number of project completions of major work since the National Parkways program was initiated in 1933. This represented 33 individual major projects with a total value of approximately \$15,000,000 including 22 miles of paving, 59 miles of repaving, 39 miles of grading and base course, 31 bridges and grade separations, tunnel lining and extensions, slope stabilization and guardwalls.

Two outstanding projects completed included an 11-mile section of the Blue Ridge Parkway in North Carolina extending southeastward from Wolf Laurel Gap through the Cherokee Indian Reservation into Great Smoky Mountains National Park, which marks the southern entrance to the Parkway, and a 4-mile section of the northbound lane of the Gatlinburg Spur along the west side of the West Fork, Little Pigeon River of the Foothills Parkway.

Completion under the minor roads, buildings and utilities Parkway program included the Peaks of Otter, Va., information center on the Blue Ridge Parkway, numerous public service features on the Blue Ridge and Natchez Trace Parkways such as additional picnic ground facilities, campground roads, trails, comfort stations, maintenance buildings and utility systems and several employee residences.

As of June 30, 45 major contracts totaling approximately \$24,800,000 were in process under the Bureau of Public Roads program, including 68 miles of paving, 97 miles of grading and base course, 52 bridges and grade separations, and other work.

Under the authority of the Federal-Aid Highway Act of 1954 field studies were carried out jointly by the Bureau of Public Roads and National Park Service in Louisiana on the location of the Great River Road. Thus far, nine of the ten Mississippi River States have been furnished advisory services.

Buildings

The building construction program continued with emphasis on providing visitor facilities in the National Parks and Monuments.



There is no finer recreational and educational activity than camping in the great outdoors. Mission 66 is adding new camping grounds to the National Park System.

Visitor Centers, important to interpretation of the parks, were completed or were under construction at Abraham Lincoln, Hopewell Village, Pipestone, Moores Creek, Badlands, Mammoth Cave, Theodore Roosevelt, Bryce Canyon, Moose, Grand Teton; Fort Union, Zion, Cumberland Gap, George Washington Carver, Wright Brothers, Parachute Key, Everglades; Death Valley, and Great Smoky Mountains. Plans are nearing completion for Visitor Centers and administration buildings at Gettysburg, Fort Donelson, and Mound City Group.

The progress in the restoration of historic buildings is best exemplified in the Independence National Historical Park where New Hall, in Carpenters Court, has been reconstructed and the Merchants Exchange Building, one of the historic buildings designated to be restored and retained, has been rehabilitated to provide offices for Region Five and the Eastern Office, Division of Design and Construction. The last major demolition contract for removing nonhistoric buildings has been awarded with completion scheduled for late this fall.

Emergency measures were taken to protect Congress Hall in Independence Square from threatened collapse following damages sustained in the heavy snows of the previous year.

A total of 406 miscellaneous buildings were rehabilitated or constructed at a cost of \$9,700,000.

The housing situation in parks and monuments was further improved by the provision of 107 permanent and 75 seasonal units programed during the 1959 fiscal year.

An agreement was reached with the city of St. Louis and the Terminal Railroad for the relocation of the elevated railroad tracks between the Memorial and the Mississippi River levee at Jefferson National Expansion Memorial in St. Louis and a contract was awarded in the amount of \$2,421,000 for this work. The development cost for this project is shared by the city of St. Louis and other contributed funds in the ratio of \$1 of non-Federal for each \$3 of Federal funds. The present schedule of construction is predicated upon completion of the entire project, estimated to total \$22,500,000, in time for the proposed sesquicentennial celebration in 1963.

New impetus was given to the Historic American Buildings Survey in its second year of resumed recording activity. A unit was established in the Western Office, Division of Design and Construction, in San Francisco, and in collaboration with the University of California produced measured drawings and photo-data books of a number of historically important structures in California. This unit will continue during the present year with the assistance of a supervisor and a student measuring team.

A supplement to the Catalog of the Measured Drawings and Photographs in the Library of Congress, listing and describing material added to the collection since March 1, 1941, was compiled and published. The Specifications for the Measurement and Recording of Historic American Buildings and Structural Remains was revised and distributed.

The Building Construction Handbook was completed, printed and distributed to the field. This handbook prescribes regulations governing the planning, location, construction, alteration, repair, moving and demolition of buildings in the National Park System.

Utilities and Miscellaneous Structures

The Service is continuing the progress of improving utilities and miscellaneous structures as reflected in the following general statistics:

There were approximately 677 additional campsites in 25 campgrounds, this included newly developed campgrounds and additions to existing ones. There were 90 water systems and 76 sewage systems completed. These projects increase water storage facilities by 3,400,000 gallons, all representing a capital investment of approximately \$2,705,000.

Master Plans

Emphasis is continuing on the preparation of Master Plan drawings on a schedule which will assure thorough studies of development needs in relation to current and future management requirements well in advance of the establishment of firm programs. Over 500 preliminary and final Master Plan drawings were prepared.

An important step was taken toward the integration of the Mission 66 Prospectus and other planning documents into the Master Plan. In its new format, the Master Plan will become a more effective instrument in establishing and defining the broad objectives, policies, and requirements for all elements of the park program.

Office of Audits

Of major importance during the year was a comprehensive study of the Service's audit policies and practices which was conducted by a Departmental committee. Following recommendations of this committee, the audit scope has been changed to place primary emphasis on accounting and financial matters rather than management aspects. Other recommendations dealt with improving the effectiveness of report distribution and taking follow-up action by administrative officials.

During the year more than 40 reports were issued, eliminating a backlog on hand at the year's start. To comply with the survey recommendations will entail a 2 to 3-year audit cycle. Experience under the new program shows an urgent need for additional auditors to achieve this goal.

National Capital Parks

An Employee Relations and Training Officer was hired in August 1958. Training courses for maintenance, United States Park Police and history section personnel were conducted. There was created in November 1958 a Board of United States Civil Service Examiners to hold competitive examinations for positions peculiar to this office.

Visitor Services

Intensive use of the parks continues creating heavy demands on personnel and park facilities. An estimated 45 million persons used the facilities and services provided by the National Capital Parks; more than 5 million visitors were counted at the five major

national memorials; there were 267 special events attended by over 2 million persons; park naturalists and historians served approximately 300,000 people, and nearly 6 million listened to interpretive recordings or participated in self-guided tours.

Protection

Criminal complaints handled by the United States Park Police increased about 8.5 percent and noncriminal complaints were up nearly 25 percent over fiscal year 1958. Some 1,500 traffic warning tickets were issued and there were upwards of 25,000 arrests and citations involving adults. In the Semi-annual Firearms Qualification Program, 99 percent of the Force qualified for medal awards. The recently announced Promotion Competition Program was received with enthusiasm and steps have been taken to put it into effect.

Physical Improvements

Some 200 plans relating to developments were prepared and nearly \$4 million were expended on about 60 contracts. Much time was spent in analyzing highway plans of other agencies, e.g. approaches to Potomac bridges, the Inner Loop and the Glover-Archbold Parkway, and in preparing proposals to minimize their impact on the parks. Horticultural activities included planting of thousands of trees and shrubs, salvaging of top soil, and improving neighborhood parks. Major construction included two stables, several bridges, road realignment and paving in Rock Creek Park; reroofing of Lincoln Memorial; rehabilitation of the Washington Monument elevator; repairs and stabilization at Fort Washington, Custis-Lee Mansion and the Old Stone House; and extension of the George Washington Memorial Parkway.

Research and Planning

Contracts have been let for the construction of the Rock Creek Nature Center, for continuance of grading and surfacing of portions of the George Washington Memorial Parkway in Maryland and Virginia, and structures at Prince William Forest and Catoctin Mountain Parks. Historical research has been conducted at Fort Washington, Custis-Lee Mansion, House Where Lincoln Died, and the Old Stone House. Studies were made on a land acquisition problem at Great Falls and for extension of the George Washington Memorial Parkway to Woodlawn and beyond. Development plans are under way for a mechanical maintenance shop headquarters, and a park operations building.

Office of Territories

Anthony T. Lausi, *Director*



THE FISCAL YEAR ended June 30, 1959, was one of major accomplishment from the standpoint of the basic objectives of the Department of the Interior and its Office of Territories in fostering social, economic and political development in the territorial possessions of the United States. The outstanding political achievement of the year was the attainment of Statehood by the Territories of Alaska and Hawaii.

On July 7, 1958, the President of the United States approved the Alaska Statehood Act, thus ending a more than 40 year effort to obtain full self-government for that Territory. On completion of the necessary procedural steps, Alaska was formally admitted as a State by Presidential proclamation on January 3, 1959.

Less than 3 months later, the Congress acted favorably on Statehood legislation for Hawaii and the President approved the Hawaiian Statehood Act on March 18, 1959. This action culminated 50 years of effort on the part of the people of Hawaii to become a free and equal member of the American Union. Their intense desire for Statehood became abundantly clear when the voters on June 27, 1959, endorsed Statehood by the overwhelming majority of 17 to 1.

Shortly after the close of the fiscal year, Hawaii became the 50th State of the Union by Presidential proclamation on August 21, 1959.

In the remaining territories, the Virgin Islands, Guam, and American Samoa, and in the Trust Territory of the Pacific Islands there are found widely differing stages of social, economic and political development. In each area, paying due regard to local customs and aspirations, it is the policy of the Office of Territories to assist and encourage the people in economic betterment and the growth of self-government.

During the past year, most areas registered increased revenues and business and commercial activity despite some severe economic

reverses. In American Samoa, a hurricane caused widespread damage in the Manu'a island group and destroyed coconut plantations and other crops essential for cash income or subsistence. Prompt and strenuous efforts were required to alleviate suffering and to begin restoration of crops, dwellings, and other facilities.

The economy of the Trust Territory of the Pacific Islands still showed the effects of the disastrous hurricanes of the previous year. Agricultural emphasis in the devastated atolls was placed on replanting coconut groves with improved seed in a manner designed to insure maximum future yields. Copra is the major cash crop of the Trust Territory although programs of agricultural diversification are under way.

In the Virgin Islands, a serious water problem will be met with the construction of a salt-water distillation plant to be built and operated by the Virgin Islands Corporation. As a byproduct of the distillation process, electric energy will be generated to help meet the growing power needs of the island of St. Thomas.

In the field of government, the most dramatic progress has occurred in the Trust Territory. In this far-flung territory first emphasis is placed on the local level. During fiscal year 1959 charters were issued to 20 municipalities while one island-group congress received a charter as did an additional district congress. Increasing numbers of Micronesians are being placed in top positions in such diverse fields as education, finance, public health, and the judiciary.

Hawaii

Although other events in Hawaii were overshadowed by Statehood and preparations for the transition to Statehood, fiscal year 1959 saw Hawaii experience unprecedented growth and prosperity. Significant advances were made in practically all fields.

The expansion of Hawaii's economy is clearly indicated in the revenues, appropriations, and expenditures of the Territorial government. As a result of new tax laws in 1957, the Territory ended the 1957-59 biennium with a surplus of \$14 million. The last session of the Territorial Legislature, meeting in the spring of 1959, appropriated a record-breaking total of \$227.6 million for the 1959-61 biennium, or \$59.2 million more than the 1957-59 appropriation. Even with this increase, it is anticipated that there will be a \$1.3 million surplus at the end of the 1959-61 biennium, despite slight reductions made in tax rates by the 1959 legislature.

Hawaii's economic base continued to broaden. Manufacturing, nearly trebled since World War II, has been given further impetus



Hawaii became a State in White House ceremonies on August 21, 1959. Onlookers were the Vice President, the Speaker of the House, the Secretary of the Interior, Secretary of the Territory of Hawaii, and part of the Hawaiian Congressional Delegation.

by the beginning of work on an oil refinery and a steel mill—both new industries to the islands. Diversified agriculture increased substantially, and the construction industry sustained the boom which has seen it rise from \$68 million in 1950 to an estimated \$200 million in 1959. Tourism continued to break all records with new hotels and other facilities finding it difficult to keep pace with increasing demands. Sugar and pineapple production remain the strong mainstays of the Hawaiian economy, however.

Politically, the past year was extremely active. In November 1958, the last territorial elections were held to elect a reapportioned legislature. This legislature, almost doubled in size, met in the spring of 1959. Passage of the Statehood Act in the middle of the session turned the political spotlight on the first State election.

Nevertheless, the last territorial legislative session was an active one. It provided for the transition to Statehood by creating a joint legislative interim committee to consider problems of reorganization. It passed one of the most liberal unemployment compensation laws in the country and extended complete coverage to agricultural and government employees. It strengthened the administration of the courts through the establishment of an administrative office of the judiciary. It provided substantial salary



Statehood Celebration at Iolani Palace, Honolulu.

increases to government employees, teachers, and the faculty of the University of Hawaii. The legislature also adopted a comprehensive ground water control law based upon the Model Water Use Act.

Finally, the 1959 Legislature took the first steps to realize Hawaii's destiny as a bridge between East and West by setting up Asian studies and overseas operations programs at the University of Hawaii.

The past year witnessed significant development of such basic facilities as highways, airports, and water projects. Highway expenditures exceeded the \$21.8 million record set in 1958. Major water developments have been advanced on all islands, including the 5-mile long tunnel on Molokai and the successful drilling of wells and construction of a distribution system at Kona on Hawaii. Also, Hawaii is entering the "jet age" with the building of a \$22 million airport at Honolulu, on which construction began this year.

Enrollment of new students in the public schools is increasing at the rate of 4,000 per year, making necessary a more than \$60 million building program for the next 6 years.

Housing continues to be one of the major problems despite the construction of 7,839 units of Capehart military housing on Oahu at a cost of \$105 million. The shortage is due to high cost of land and construction, population increase, and the displacement of many families by large-scale Government construction programs. Nevertheless, much improvement is occurring.

Alaska

As in Hawaii, Statehood overshadowed all other events in Alaska during the fiscal year. Upon the approval of the Statehood Act on July 7, 1958, the necessary Statehood referendum and elections were promptly scheduled. With little public notice Territorial agencies and the Department of the Interior began to draft plans for prompt and efficient transition to State Government.

Enactment of Statehood legislation focused nationwide attention on Alaska. Economic development and growth of population, for several years on the increase, were accelerated. In spite of this increase, the economy had remained heavily one-sided and, except for the construction and rapidly expanding tourist industries, largely rests upon extractive industries such as fishing and mining.

Little manufacturing took place in the Territory. The major exception was the pulp plant at Ketchikan to be followed by a second pulp plant at Sitka, scheduled to begin operations in the fall of 1959.

Drilling for oil and gas, for the first time on an extensive basis



In White House ceremonies attended by the Vice President, the Speaker of the House, the Secretary of the Interior, the Alaska Congressional Delegation, the last appointed Territorial Governor and the Acting Governor of the Territory, the President signs the Alaska Statehood Proclamation.

by major oil companies, continued and offers bright prospects for new industries in interior Alaska. Oil activities in Alaska were spurred by the negotiation of three oil development contracts which require oil companies to seek oil actively during the life of the contracts. Several private firms were engaged in developing export markets for Alaskan coal which hitherto had served only the local domestic market.

Amid enthusiasm and boom atmosphere, Alaska stands on the threshold of a new era of economic development. It is a challenge Alaskans have proven themselves well able to meet.

Guam

A new cement packaging plant and several commercial construction companies started operations on the Pacific island of Guam during fiscal year 1959. Retail sales, private and commercial building, bank clearances and tonnage receipts at the commercial port all have grown.

The Military on Guam awarded several local contracts for defense installations and also increased purchases from local farmers. The Department of Agriculture, in a program to improve the live-stock strain, imported cattle and swine from the mainland. An economic survey was conducted for the Government of Guam by a Stateside research institute.

To encourage increased political interest and participation in local government, a District Government Council was organized, composed of the 19 elected District Commissioners and three Assistant Commissioners. The Council was created to promote and improve efficiency in district and village governmental operations and to provide a medium for closer relationship and understanding between the executive branch and the people of Guam.

A general election was held in November 1958 for members of the 5th Guam Legislature. Among the major laws enacted by the Legislature were authority for the Territorial Planning Commission to undertake urban planning and to accept grants from the Federal Government; an act for uniform reciprocal enforcement of family support; scholarships and student loans; a financial responsibility law for automobile owners; and amendments to the law relating to applications for commercial and services licenses. The Legislature also took action with respect to the pay schedule of ungraded government employees. Two bills were vetoed by the Governor, one pertaining to the tenure of officials requiring confirmation of the Guam Legislature and the other relating to the Small Claims Court. The vetoes were sustained by the Legislature.

An appropriation was obtained for a study of personnel and management to pave the way for more efficient and economical operation of the government. The first increment of the Administration building was nearly completed, a step toward discontinuing executive branch use of old temporary structures. Of direct importance to the people of Guam and business and commercial interests was completion of the translation of archaic Spanish land records and the award of a private contract for improvement of land title records.

In the field of education, four new school buildings were opened and construction progressed on a new junior college building.

A more favorable situation in the collection of income taxes was reported by the Island's Department of Finance, largely because of an amendment to the Organic Act by the United States Congress. The office of the Auditor-General began operations. An actuarial study was completed for the Retirement Fund. In order to resolve problems arising from the operation of the Navy and Commercial Ports, a Seaport Advisory Board was established between the Government of Guam and the Navy.

American Samoa

Through developments in airport construction, air transportation, a greater influx of tourists and a general increase in economic activity, American Samoa continues to unfold its ancient culture and traditions to the eyes of the outside world.

Of prime importance to the future of the territory this year was the virtual completion of the engineering plans, specifications and cost estimates for the international jet airstrip at Tafuna Airport. With funds already approved, construction will begin in July 1959.

A significant development in air transportation occurred when it became apparent at the close of the fiscal year that Samoan Air Lines, Ltd., would begin operations in July 1959. Samoan-owned, this airline will serve to link the island territories and help make the South Pacific area a more closely integrated regional entity.

In anticipation of further increases in air traffic, including flights of larger and heavier piston-powered aircraft, a 100-foot asphalt strip covering the entire length of the existing 6,000-foot Tafuna airfield was begun with paving completed shortly after the end of the fiscal year.

The first increment of the new Administration building under construction at Agana, Guam.



A new \$79,000 Marine Railway was completed during the year. This was a major construction project and is expected to be an important element of economic development. Largest of its kind in the area, it will serve an important need in the maintenance and servicing of vessels up to 350 tons.

Business and economic activity reached encouraging levels during the year. A new high was reflected in every department of The Bank of American Samoa. Deposits totaled \$1,934,933 at the close of the fiscal year, an increase of \$231,000 over the previous year.

Actual Government receipts collected were \$858,141 compared to \$712,980 last year. Exports totaled \$7,605,701 as compared to \$5,854,258 for the previous year.

In February 1959 the island group of Manu'a suffered great destruction from one of the most severe hurricanes on record. Hundreds of houses were destroyed or suffered major damage and the majority of the coconut plantations and other cash and subsistence crops were wiped out.

Manu'a was immediately declared a disaster area by the Governor and a central relief committee established. Credit goes to the leadership of the chiefs in local government, the local Department of Agriculture, and to the courage and initiative of the people in rebuilding destroyed homes and replanting crops. The United States Department of Agriculture furnished prompt relief in the form of surplus foods and generous donations were received from private sources, churches, and from the people of Western Samoa.

A highlight during the year was the successful South Pacific Tuberculosis Conference held in American Samoa in November 1958 and attended by 30 professional medical and public health doctors and specialists from many countries.

In April and May 1959 American Samoa was represented by a delegation of five Samoans at the Fourth South Pacific Conference of the South Pacific Commission held in Rabaul, Territory of Papua and New Guinea. Excellent reports were received of the contribution made by these delegates.

Vigorous efforts were made during the year in the field of youth development and youth fitness. Organized atheletic programs and inter-village competition were carried out in the schools and villages. To help carry on this work in cooperation with the Youth Development Officer, a Samoan Recreation Program Supervisor was appointed from Honolulu.

Trust Territory of the Pacific Islands

A United Nations Visiting Mission made a month's tour of the Trust Territory of the Pacific Islands, a strategic trusteeship area administered by the United States through a High Commissioner functioning under the Department of the Interior. Members of the Mission conferred with representative Micronesian leaders in the districts and examined all aspects of the operation.

At the close of the fiscal year the United Nations Trusteeship Council began its annual examination of the Trust Territory administration.

Micronesian employees of the Trust Territory Government were promoted into administrative positions as they became prepared through education and experience to fill the posts. Three additional Micronesians advanced to the top health offices in their respective districts, making a total of five serving as district public health administrators. Others were placed in responsible positions in such fields as education, finance and judiciary.

An in-service program of vocational training was inaugurated, with two groups of Micronesian employees in trades categories brought to the Trust Territory shops at Guam for instruction. Similar programs for other types of administrative work are scheduled for the coming year. Supervisory development courses were conducted at headquarters and in the districts over 20-week periods, with 185 employees participating.

With the chartering of an additional district-wide congress and one island-group congress, and of 20 municipalities, plus the conversion of a bicameral congress to a unicameral body, progress in political development was well ahead of the target dates set.

Agriculture and fishing continued to be major elements in the economic development of the islands. An overall program was carried out for rehabilitation of the communities affected by the destructive typhoons of 1957 and 1958. Agricultural specialists were detailed to the more seriously damaged atolls to provide assistance. The large-scale planting of new coconut groves by scientific methods is expected to prove of long-lasting benefit to the islands and their inhabitants; over 220,000 selected seed coconuts were shipped from Yap District for planting in other districts. Decrease in copra production from that of the previous year, a result of typhoon devastation, was partially compensated by increased copra prices.

Cacao development was strengthened by designation of a specialist to oversee the program; the first course in cacao cultivation to be held in the Trust Territory was inaugurated, with selected trainees participating. New marketing arrangements, and improved



Seed coconuts at Yap, ready for distribution to other districts of the Trust Territory.

shipping facilities, brought increased produce sales. Further development of agricultural centers for propagation and distribution purposes; cultivation of subsistence and economic crops, livestock and poultry; soil conservation and improvement, and timber production were other aspects of the agricultural program. Under direction of a staff entomologist, efforts were continued toward the control and eradication of agricultural pests.

Although trochus, second most important export item of the Trust Territory, has met a setback in the world market due to competition from plastics for buttons, substantial amounts of the shells were harvested and sold during the year, and the establishment of sanctuaries for conservation purposes was continued.

A commercial fishing project was developed in Palau District under administrative organization and direction. A boat especially designed for the purpose was procured, provisions for icing and storage made, and the fishing operation begun. Future plans call for establishment of a small-scale fish-canning plant, and inauguration of similar commercial fishing projects in some of the other districts.

In each district, one or more chartered trading companies supplied the needs of the inhabitants and purchased local products. Assets of the nine companies, all Micronesians owned, stood at ap-

proximately \$2,000,000. Other private concerns were in operation in all districts.

Transportation, always a major problem in the Trust Territory area of approximately 2,000 small islands set in some 3,000,000 square miles of ocean, was put on a regular basis with the establishment of a firm sailing schedule for the chief supply vessels. Arrival and use of the newly constructed M/V *Kaselehlia*, designed for Trust Territory needs, eased the tight shipping situation to some extent. Flights by air, using three amphibious SA-16 planes, were made on weekly schedule to the major districts, transporting personnel, mail and priority cargo.

Among major construction programs was the new Pacific Islands Central School at Ponape, including classrooms, administration building, auditorium, cafeteria, dormitories and faculty housing. A dock and harbor rehabilitation project at Truk was getting under way as the fiscal year ended. Local labor is being utilized in all government construction, providing new skills for Micronesian workers and increasing their purchasing potential.

Grants-in-aid for new elementary schools were provided by the Trust Territory Government, with eight schools under a joint grant-and-local-fund program, and plans for others made and approved. Teacher trainers supervised the Micronesian teachers of elementary schools, both in the field and through teacher institutes and summer sessions. One new public intermediate school was opened, and new plants or additions to present intermediate school structures are planned for all districts. Intermediate schools and high schools under mission sponsorship augmented the training provided by the public intermediate schools and at the Pacific Islands Central School.

Increased emphasis was placed upon college scholarships. Forty-eight students were studying abroad on Trust Territory Government scholarships, and eight grants were made for studies leading to college degrees.

The School of Nursing continued its training of nurses for the public health staffs of the districts. Refresher courses for medical practitioners, and training programs for laboratory technicians, dental practitioners, health aides and nurse aides continued to be given in the district hospitals, and in hospitals at Guam and Hawaii. A 6-week Health Education course in which 39 Trust Territory personnel participated, was held at Guam under combined auspices of the Trust Territory Government, the U.S. Navy-Saipan District Administration, and World Health Organization. Pilot field health projects were conducted in various districts.

Virgin Islands

On September 25, 1958, the Honorable John David Merwin was sworn in as the first native-born Governor of the Virgin Islands, succeeding the Honorable Walter A. Gordon who was appointed Judge of the U.S. District Court for the Virgin Islands. At the same time, the Honorable Roy Williston Bornn, also a native-born Virgin Islander, was sworn in as Government Secretary, replacing Mr. Merwin.

The Government of the Virgin Islands continued to progress both in organization and in fiscal affairs during fiscal year 1959. Under the Office of the Government Secretary, funds have been appropriated and a contract made for the development during the next 2 years, with the aid of skilled consultants, of a modern tax assessment program.

Total revenues collected during the fiscal year amounted to \$5,224,156.95—the highest in the history of the territory. This represented an increase of 25.5 percent over the revenues of the preceding fiscal year.

Outstanding activities of the Department of Tourism and Trade were the establishment of an office in Puerto Rico and a public relations office in New York City to handle tourist promotion and general publicity. It is estimated that 150,000 visitors came to the Virgin Islands and spent approximately \$18,000,000. Eighty-eight cruise ship visits during the year again broke all records.

The greatest achievement in the field of public works during the year was the awarding of a \$1,302,585 contract for the reconstruction of the Alexander Hamilton Airport in St. Croix.

With the steady increase in the number of residents and visitors to the islands, and with only a total annual rainfall of 33.69 inches, the greatest problem continued to be the water supply. In order to satisfy needs on St. Thomas, the Government tug and barge, supplemented by chartered equipment, made 230 trips to Puerto Rico bringing in a total of 49,665,800 gallons of water—10,000,000 gallons more than in the preceding fiscal year.

Under the Department of Education, two new modern school buildings in St. Croix with a total of 30 classrooms were dedicated. One old elementary school was reopened. In St. Thomas, renovations to existing facilities and the addition of two new buildings with 10 classrooms were completed. Rehabilitation was commenced on the headquarters building of the Department of Education.

In the Department of Health, plans were initiated to provide for the construction of out-patient, laboratory and office facilities at the Charles Harwood Memorial Hospital in Christiansted.

The Department of Social Welfare was assigned a new program of providing emergency housing for displaced families and construction began on a model unit. The 1958 congressional amendments to the Social Security Act enabled the Department to increase grants to the public assistance case load of 1,600 by approximately \$3.75 per case.

In the field of public safety, police strength has been increased. A team of traffic engineers, loaned by the Commonwealth of Puerto Rico, surveyed traffic conditions and suggested a series of improvements.

Under the Department of Agriculture and Labor food production program several thousand vegetable slips were supplied to farmers. The vegetables harvested from this program were distributed to public institutions as a needed dietary supplement. The Department continued its technical and other service programs for farmers.

In the Department of Property and Procurement, an economist from the Commonwealth of Puerto Rico made an excellent report on the subject of containing the spiralling prices of foodstuffs in the Virgin Islands. The report will be the guidepost for action in the coming fiscal year.

Virgin Islands Corporation

The Virgin Islands Corporation was extended until June 30, 1969, under Public Law 85-913, approved September 2, 1958.

The major change in the act extending the Corporation was a provision authorizing the Corporation to operate and maintain salt water distillation facilities in St. Thomas, Virgin Islands. The proposed plant will supply water for sale to the Government of the Virgin Islands and, as an integral part of the installation, the power facilities of the Corporation will be increased by the addition of a 2,500 kilowatts steam turbine. Engineering studies for the plant are under way.

The principal activities of the Corporation continued to be the production of sugar and the generation and distribution of electrical power. The production of sugar was more than double that of the previous year. A total of 116,447 tons of sugarcane were ground and 12,543 tons of sugar, raw value, were manufactured, as compared to less than 6,000 tons last year. The production of sugarcane by the Corporation showed a profit of \$85,350.88 for the year.

An engine explosion seriously hampered sugarcane milling operations and the factory operated at reduced capacity with considerably lessened efficiency. The manufacture of sugar showed a loss of

\$222,139.31. As a result of the explosion, approval was given by the Board of Directors and by the committees of Congress to invest \$360,000 in mills and steam turbine equipment. The new equipment is expected to be in operation for the 1960 crop.

The Power Department in St. Thomas suffered a financial loss for the first time since this operation was taken over by the Corporation in 1952. A series of engine and generator breakdowns, together with a sizeable accidental loss of fuel oil, resulted in an overall loss of \$119,070.99. The substantial increase in power consumption, limited generating capacity, and the need for operating the equipment to the limit of its output, contributed to the serious breakdowns experienced. This problem will be alleviated by the installation of a new 2,500 kilowatt engine expected to be on the line in the fall of 1959. In spite of the difficulties the peak power load on St. Thomas increased 9.8 percent over the previous year and consumers increased from 4,586 to 4,860.

Power operations in St. Croix showed a profit of \$17,201.85. There was an increase of 9.7 percent in power load over the previous year. The total number of consumers on St. Croix increased from 3,787 in 1958 to 3,988 in 1959.

The Corporation continued to carry out various agricultural programs under grants from the Congress. The construction of earth dams on the Islands was continued. Seven dams on St. Thomas and St. Croix with an estimated holding capacity of 6,991,380 gallons were constructed and one older dam was reworked. The dams are important to agriculture and have proved of great value in view of the acute water shortage.

A total of 523 acres of brush land were cleared making a total of 6,003 acres cleared under the land clearance program since 1952. The program was discontinued as of June 30 since most of the more desirable land for pasture and cultivation, owned by small farmers, has been cleared.

The forestry program was primarily concerned with the establishment of permanent forest cover without encroaching upon the demands of other aspects of proper land use. Substantial plantings of Dominican mahogany and teak were established on Government and private lands. A program for the improvement of natural forest was initiated. A utilization program providing sawmill facilities was in operation and provided lumber for local industry.

The Corporation continued to manage the Navy properties on St. Thomas for the Secretary of the Interior. The income derived from these properties has more than doubled since VICORP took over the properties, and now exceeds \$250,000 per year. The income has provided funds for maintenance and improvements of the facilities.

ties. During the latter part of the year the airport runway and a part of the terminal building were turned over to the Virgin Islands Government.

The Alaska Railroad

Gross income for the year amounted to \$13,482,545.96. After deducting expenses of \$13,138,744.79, net income of \$343,801.17 is reported. This represented an increase of \$234,784.55 over the preceding year.

Improved service to patrons was made possible through expansion of unitized cargo facilities. Special authority was obtained from Congress for the procurement of 160 unit rail boxes and auxiliary equipment. About half of the units were received prior to the close of the fiscal year and the balance will be placed in service early in fiscal year 1960.

During the fiscal year the Railroad completed engineering studies with equipment firms and began installation of an electric traveling bridge gantry of unique design to facilitate the rapid transfer of unit rail boxes from rail flat cars to highway trucks and vice versa. This equipment will not only serve the unit rail box program, but will substantially up-grade the present "piggy back" service being offered to motor freight carriers.

Construction of a modern passenger station at Fairbanks was undertaken with completion expected during fiscal year 1960. This will replace a structure erected in 1923.



Unit Rail Boxes of The Alaska Railroad improve and speed service.

Tie renewals and ballasting of the remaining portion of the main line between Broad Pass and McKinley Park were completed. This project was begun in the preceding year.

A project of replacing ties and ballasting with crushed gravel on a stretch of roadway extending a distance of approximately 30 miles north from Healy was approximately 30 percent complete at the end of the year. The work is being accomplished by force account, furnishing employment to some 65 natives.

The Railroad constructed more than two and one-half miles of new spurs and sidings, and completed survey work for a main line change of approximately 7 miles in connection with the military project at Clear. In the coming year about 7 miles of new main line track will be turned over to the Railroad by the military, and the Railroad will transfer about 5 miles of existing main line to the military in connection with the Clear project.

Among the projects scheduled for fiscal year 1960 are the completion of new section houses at Garner and Eielson, elimination of frost heaves on about $3\frac{1}{2}$ miles of roadway at various locations, and modernization of approximately 15 miles of track.

Alaska Public Works

In 1949, by Public Law 264, the 81st Congress authorized a \$70 million program of public works in Alaska to foster economic and social development through provision of facilities for community life. This 5-year act was later extended by Congress to June 30, 1959. Under this program the Federal Government, upon application by a public body, such as the Territory, a city, a school or utility district, finances the entire cost of construction of approved projects and, upon their completion, transfers them to the public bodies for which they were built at prices that will return to the Treasury of the United States not less than 50 percent of the total cost.

In providing basic community facilities and other essential public works, the program has made a major contribution to the development of Alaska.

Through June 30, 1959, congressional appropriations totaling \$69,976,200 have become available. Allotments have been made in the amount of \$69,888,280 to 172 projects, to provide 61 school units, 13 hospitals and health centers, 8 municipal buildings, 50 sewer and water projects, 27 other projects including streets, utilities, and small boat harbors, and 22 units for emergency relief with a value of \$436,400. Of these, 145 projects valued at \$54,580,356 are complete. Another 12 projects estimated to cost \$6,235,896 are substan-

tially complete and in use, and 15 with an estimated value of \$9,072,028 are in the construction stage. During the year planning was completed on 18 project units and contracts awarded. All are scheduled to be under construction during the 1959 season, with final completion of all units in 1961. However, strikes of skilled workers under way on June 30 were delaying progress and, if continued, will seriously delay the completion of the units affected.

Office of the Assistant Secretary

Fish and Wildlife

Ross Leffler, *Assistant Secretary*



THE ASSISTANT SECRETARY for Fish and Wildlife discharges the duties of the Secretary of the Interior with respect to the Department's programs in the field of fish and wildlife. He is responsible for secretarial direction of the Fish and Wildlife Service and its constituent bureaus.

Legislatively, the year ending June 30, 1959, was an especially important period for the Department's Fish and Wildlife Service.

Alaska Statehood, amendments to the Wildlife Coordination Act, passage of the \$3 duck stamp law and provision for a long range study of the effect of pesticides upon fish and wildlife were important legislative actions which related to the work of the Service.

There were numerous important developments in the nonlegislative field in international and national fisheries, waterfowl management and research on commercial and recreational fish and mammals.

The Alaska Statehood Act and subsequent events provide for ending more than half a century of Federal management of Alaska's fish and wildlife resources. As fiscal 1959 drew to a close it seemed apparent that on January 1, 1960, Alaska would have complete responsibility for its sport fish and game resources and for the commercially important salmon fishery. The Federal Government will continue jurisdiction over the Pribilof Island seal herd and over other sea mammals. The Government will also continue its research responsibilities on salmon and other species of fish and wildlife. The interim between the passage of the Statehood Act and the time when the new State will actually assume its full responsibilities is being used as a transition period with the Service rendering all aid possible

to personnel of the new State who are soon to take over full responsibility.

The amendments to the Wildlife Coordination Act give greater recognition to fish and wildlife resources in the planning and execution of Federal projects in which fish and wildlife are affected. Steps are being taken to implement the intent of the amended act in cooperation with other Federal agencies. The States and the Fish and Wildlife Service of the Department of the Interior have a better opportunity now to stimulate the sound conservation of fish and wildlife than at any time in our history.

Legislation permitting Federal cost-sharing in fish and wildlife developments on Watershed Protection and Flood Control projects also opens new opportunities for the enhancement of fish and wildlife resources on those projects.

The \$3 duck stamp law—widely supported by sportsmen—is considered by many to be one of the most important pieces of legislation for waterfowl in the past quarter century. Briefly, it raises the cost of a Federal duck stamp from \$2 to \$3 and provides that all of the money so raised except a small proportion actually used in the printing and distribution of the stamps shall be used for the selection and acquisition of waterfowl habitat. This means that funds for the development and maintenance of waterfowl habitat and for the enforcement of Federal waterfowl regulations must come from some other source after the end of fiscal 1960.

In the commercial fishery field the international phase was more pronounced than usual in fiscal 1959. The Department of the Interior took steps with the Department of State to expand the foreign reporting program in the interest of eventually obtaining world-wide coverage of foreign fishery developments of interest to the American fishing industry. Both Russia and Japan established large scale fishing operations in the waters west of Alaska, Russian boats entered the fishery in the northwest Atlantic and Japan extended its fishing activity to various other parts of the world.

Increased interest in the ocean as a source of food is noted in the activities of other nations. In many instances, more fishing vessels are being put to sea and in practically all instances there is considerable improvement in the design of new fishing vessels.

There is growing interest in the development of shrimp beds which Fish and Wildlife Service explorations discovered off the northern coast of South America. The African coast is beckoning to many fishing firms including Americans. Explorations in the Gulf Stream off the Atlantic coast have opened up the possibilities of a new fishery there too.

The general field of oceanography is coming in for considerable study. Never in history has there been as much scientific interest shown in this area as is evidenced now. It would appear that men of all nations are suddenly realizing the possibilities of the ocean as a source of supply for many things and the realization that the ocean is something more than just a body of water between land masses. Long range plans are under way, and research plans are being coordinated throughout the Federal Government. This means that when large-scale scientific study of the ocean begins it will be concerted governmental action.

In general, the Department's Fish and Wildlife Service is taking those steps necessary to develop resources capable of withstanding the pressures of the future. A recommendation was made by the Secretary of the Interior to halt further dam planning and construction in the middle Snake River until the effectiveness of fishways could be given further study.

A committee of the Service and the Columbia Basin Inter-Agency Committee recommended that emphasis on the Columbia River salmon program be placed on stream improvement and further hatchery construction be halted until the effectiveness of the present hatchery program could be ascertained.

Steadily more effective too is the partnership effort of State and Federal agencies to plan and act to meet future needs of the ducks and geese. The idea of Continental control of migratory waterfowl is growing. There is greater public appreciation now of the valuable role of research. It is playing a more important part in the conservation of offshore fisheries and it is becoming more and more a valuable tool in the management of recreational resources generally.

Fish and Wildlife Service

Arnie J. Suomela, *Commissioner of Fish and Wildlife*



RESPONSIBILITY FOR COORDINATION of the activities of the two component bureaus of the Department of the Interior's Fish and Wildlife Service rests with the Office of the Commissioner. In addition to general supervision and coordination activities, the Commissioner's Office operates in the fields of international relations, safety, program review, and information.

The component bureaus—the Bureau of Sport Fisheries and Wildlife and the Bureau of Commercial Fisheries—are operating with a considerable degree of decentralization and most of the operating responsibility is delegated to the regional level.

The reorganization of the Fish and Wildlife Service as contemplated by the Fish and Wildlife Act of 1956 was completed during the year when each bureau established its own administrative division to handle the "housekeeping" responsibilities.

Events during the past year continue to emphasize the fact that while each bureau has its own specialized field of operation there are many areas in which there is a common interest.

The pesticide research program affects the activities of both bureaus of the Service because a continuance of unthinking use of insecticides and herbicides not only threatens fish and wildlife on inland habitat but also endangers valuable commercial fisheries dependent upon the maintenance of proper coastal and estuarial conditions.

The sudden increase in the popularity of marine sport fishing, for example, points up the necessity for considerable more research if the needs of both sport fishermen and commercial fishermen are to be met.

The amended Wildlife Coordination Act not only gives recognition to the recreational resources but it gives the Service a better

chance to bring important estuarine values to the attention of those planning Federal water projects.

Conservation work planned under the amended Coordination Act and under the amended Watershed Protection and Flood Control Act will be of primary importance to the recreational resources and will react to the benefit of commercial fisheries by reducing siltation, scouring and water pollution. These advantages were evident under the acts before amendment but will be much more evident now.

A Servicewide safety program has been organized and is already showing indications of its effectiveness. Direct benefits to operating programs are shown in reductions in days lost through injuries, a gradual reduction in disabling work injury frequency and, exclusive of the overwhelming influence of a catastrophe, a reduction in the accident cost per employee. The Federal Government, the employee, and the employee's family benefit from the Service's safety program.

In the field of information-education, efforts to extend public understanding of the work of the Fish and Wildlife Service and thus increase the effectiveness of bureau programs have been accelerated.

A broad survey to determine "the direction the informational efforts should take" was conducted. A comprehensive questionnaire was developed and distributed to more than 500 staff members in the field to permit them to evaluate the need of the Service informational program in their localities.

Because information-education is a program responsibility which must be implemented at the field level, the new approach emphasizes the importance of coordinated efforts by staff personnel in the field as part of their official duties. In the northeastern section of the country where the Service's Office of Information is providing field coordination for personnel of the two bureaus in information-education work, significant progress toward better public understanding of the programs is beginning to appear.

In the central office where information, education and extension efforts are largely in a staff advisory role for the Service's two bureaus, the functions have been realigned into three major units: editorial services, audiovisual services and special program services.

Of special interest is the increasing emphasis being placed on a mass public education campaign with respect to the objectives of Federal waterfowl regulations and changes in them which are necessary to protect species in serious short supply. Attention also is being called to the importance of halting wasteful hunting practices. The campaign employs TV shorts, posters, charts and special press releases.

In conservation education and extension, publication of articles and materials for student use received attention, and cooperation

with Boy Scout and other youth organizations continued. Assistance was also provided to the U.S. Junior Chamber of Commerce and the Standard Oil Company of California in their development of individual wide-scale privately-sponsored wildlife education programs.

The several international fishery commissions continued their activities in investigation and regulation. Satisfactory progress has been made in the solution of some difficult problems, but new problems emerge to test the best efforts in international cooperation. It is gratifying to note that many nations are now alert to the need for concerted action in the conservation of resources of common concern.

The Fish and Wildlife Service continued to aid the International Cooperation Administration in a program of technical assistance to friendly foreign nations. During the past year, fishery technicians were on assignment to the following countries: Bolivia, Surinam, British Guiana, Tunisia, Somalia, Pakistan, India, Indonesia, Vietnam, Cambodia and Korea. A total of 30 foreign students and observers arrived in the United States for technical training, and 16 of these were here at the end of the year. The training is designed to increase the knowledge and skills of the visitors so they can assume enlarged responsibilities in their home countries.

Bureau of Sport Fisheries and Wildlife

Daniel H. Janzen, *Director*



FOR THE BUREAU OF SPORT FISHERIES AND WILDLIFE, a component bureau of the Department of the Interior's Fish and Wildlife Service, fiscal year 1959 was highlighted by unusually satisfying achievements, as well as new problems in the preservation, restoration, and management of the sport fish and wildlife resources.

Progress in the legislative field was signaled by the enactment of major amendments to two key laws. The Fish and Wildlife Coordination Act was revised and expanded, and now provides that fish and wildlife conservation shall receive equal consideration and be coordinated with other features of water resource development programs.

This makes it possible for Federal construction agencies to incorporate enhancement measures in the form of land acquisitions and developments to benefit fish and wildlife as part of the work performed on water development projects. This new operational latitude is in sharp contrast to the previous authority which emphasized measures to mitigate losses. As time goes on, the benefits flowing from the Fish and Wildlife Coordination Act will be reflected in greatly increased recreational opportunities for the Nation's growing population.

Amendments to the Migratory Bird Hunting Stamp Act—strongly supported by sportsmen—accomplished several major changes. The price of the stamps that waterfowl hunters must purchase was raised from \$2 to \$3, and commencing with fiscal year 1961 all of the receipts from the sale of stamps, less the costs of printing and distribution, will be spent to acquire lands for waterfowl. This ear-

marking of the income from the higher priced duck stamps will assure the financing needed to proceed with an accelerated acquisition program. Such action is in keeping with the urgent need to purchase rapidly disappearing marsh and water areas so as to perpetuate the sport of wildfowling on a substantial scale.

Authorization was also granted to use duck stamp funds for the acquisition of small wetlands and pothole areas for waterfowl production without the requirement that they be made inviolate sanctuaries. Waiving the sanctuary requirement will reduce the costs of managing a pattern of small production units spread over western Minnesota and the Dakotas. It will not increase the harvest materially because the production areas, due to their small size and the early departure of birds from them, do not offer high quality hunting opportunities.

Two significant amendments to the Watershed Protection and Flood Prevention Act, which is administered by the Department of Agriculture, were also enacted. Federal cost-sharing of fish and wildlife developments on small watershed projects is permitted, and the Secretary of the Interior is authorized to assist in planning fish and wildlife enhancement features, as well as damage prevention measures, for such projects. These amendments have opened up new fields for fish and wildlife betterment across the country.

Because of subnormal precipitation in the Prairie States over a 2-year period, nearly 50 percent of the productive water areas in Minnesota and the Dakotas have dried up. The same general condition prevails on the southern portion of the Canadian Prairie Provinces. Unfortunately, the birds pushed on by the drought encountered a late spring in the second choice reproduction areas further north in Canada. Cold rains and snows swept across those lands in May and the ice was slow in thawing. Thus, the birds were squeezed by an unusually late spring in the North and drought in the South. The outcome in reproduction was unknown at the year's end, but during previous droughts on the prairies, prairie nesting waterfowl declined drastically in numbers.

Alaska becoming a State is having its impact upon the operations of the Bureau. When Alaska was a Territory, the Bureau was responsible for the management of sport fish and wildlife there. A provision of the Statehood Act required effective protective machinery be established by the Alaska Legislature, followed by certification by the Secretary of the Interior, so that the wildlife resources will be protected in the National interest. These actions have been accomplished, and on January 1, 1960, Alaska will manage its fish and wildlife like any other State.

While the responsibilities of the Bureau of Sport Fisheries and Wildlife in Alaska have diminished, they will still be substantial.

The nearly 8 million acres contained in established National wildlife refuges will require the usual management attention. Also, cooperation will be rendered the State on controlling predators harmful to livestock and wildlife, and in the enforcement of Federal fish and wildlife laws, including the protection of migratory birds, of which waterfowl receive the major attention.

Responsibility for the designing of projects and the performance of work on the highly important Federal aid in fish and wildlife restoration programs heretofore assumed by the Bureau are also being taken over by Alaska. As is the case elsewhere, the Bureau's role will be confined to passing upon the approvability of projects proposed by the State, and whether work on approved projects has been satisfactorily accomplished before State reimbursement claims are endorsed for payment.

Management of Fish and Wildlife

The Flyway Councils, composed of officials of the State game departments, have recognized in the management plans adopted by them the need for waterfowl surveys and banding. A number of States supplied personnel to assist the Bureau with these activities in Canada during the year. Flyway management plans call for even broader participation in the future by the States in the conduct of these activities. Flyway Councils have also shown keen interest in the depredations control projects, and have offered assistance in the way of manpower to carry out the depredations demonstration program in Canada.

The four Flyway Councils—Atlantic, Mississippi, Central, and Pacific—are preparing flyway plans dealing with the acquisition of lands for waterfowl and for the management of these birds. Depending upon the peculiarities of the individual flyways, Council recommendations have stressed acquisitions in either the breeding or wintering ranges or in both of them.

Drainage of Wetlands

Loss of Waterfowl habitat due to drainage continues to be one of the major problems confronting the Bureau. Farm drainage in Minnesota and the Dakotas increased sharply in 1958 over the average of the three preceding years. In the 91 counties containing the best remaining habitat, an estimated 10,000 potholes were drained in 1958.

In the Middle Atlantic States, cooperative planning for use of

coastal wetlands is making progress, as evidenced by passage of the Long Island Wetlands Act under which the State of New York can assist the town boards on Long Island in developing marsh areas for fish and wildlife conservation and general recreational purposes.

Endangered Species

In its role as protector of endangered species, the Bureau has intensified research on whooping cranes and nene geese. A protective project also was initiated on the Laysan teal. Although the bald eagle is not in the category of an endangered species, a recent decline in Atlantic populations of this important bird has focused attention of Bureau research men on its breeding success. Research also has been intensified on the diving ducks, among which the redheads and canvasbacks hold high rank. These birds still are sufficiently abundant to provide hunting, but recent population

Census of Wintering Waterfowl on Federal Aid in Wildlife Restoration Project.



declines make it essential that they receive special attention to prevent over-harvesting.

The whooping crane fared better than in any of the past 20 years. Nine young of the year, the largest number of young recorded during two decades, were included among the 32 wild birds successfully wintering at the Aransas Refuge in Texas.

The nene goose of Hawaii is being studied under contract with the Board of Commissioners of Agriculture and Forestry of Hawaii. Field studies revealed that the wild nenes had a reasonably successful nesting season last year.

In order to preserve breeding stock to insure against depletion in their native habitat, a number of Laysan teal, a highly vulnerable bird of the Island of Laysan in the Hawaiian Islands, is being distributed to a selected list of zoological parks for propagation. This work is being done in cooperation with the Hawaiian game personnel who captured the birds and sent them to the aviaries.

Upland Game Birds

Field studies disclosed that, with the exception of white-winged doves, the population status of migratory game birds other than waterfowl remained at the same general level as in 1957. The white-winged dove breeding population decreased approximately 27 percent over that of the previous year. A proportional decrease in the 1958 fall flight of these birds was noted during migration. However, favorable nesting conditions this spring have resulted in a high degree of production which more than compensated for the decrease noted the previous fall.

Acquisition of Lands

The National Wildlife Refuge System was enlarged by the purchase of 28,361 acres of land in 112 separate ownerships, and the reservation of 46,713 acres of land by Executive and public land orders. Additions to the migratory waterfowl refuge system featured the 4,400-acre Pixley Refuge in Tulare County, Calif., and the 7,700-acre Buffalo Lakes Refuge in Randall County, Tex. These two refuges were the result of land transfers from the Department of Agriculture. In Alaska, the Simeonof National Wildlife Refuge containing 10,442 acres of land and water was established by the withdrawal of public land for the preservation and propagation of sea otter and other wildlife.

Migratory Bird Conservation Commission Action

The Migratory Bird Conservation Commission held one meeting during the year, and approved the purchase of two new refuges—the Mackay Island National Wildlife Refuge of 7,856 acres of land in North Carolina and Virginia, and the Modoc National Wildlife Refuge of 6,049 acres in northeastern California. The Commission also approved the acquisition of 11,300 additional acres for eight existing National Wildlife Refuges.

Land Acquired for Fish Research Facility

The Fish Research and Rice Area Act of March 15, 1958, authorized the acquisition of land and the construction of facilities necessary for research in the production of fish on rice-producing areas during the time the land is not in rice production. The Bureau acquired 86 acres in Arkansas for this purpose, and the remaining 211 acres needed are being purchased there.

Developments

Congress provided funds to continue the construction of new hatcheries at Garrison Dam, N. Dak.; Gavins Point Dam, S. Dak.; and Pisgah National Forest, N.C. Funds were provided to begin

Hagerman, Idaho, Fish-Cultural Station.



construction of a new trout hatchery at Willow Beach, Ariz. Funds were also provided to continue the improvement and expansion of facilities at seven existing hatcheries.

Expanding Hatchery Production

Agencies responsible for the maintenance of sport fish populations in the States are showing great interest and activity in the improvement and reestablishment of desirable fish populations. This includes the establishment of trout populations in reclaimed waters, below high dams, and the reestablishment of desirable warm-water species in waters inhabited by nongame fish. Combined with normal requirements, these activities have greatly increased the need for fish from State and Federal hatcheries.

Improving Hatchery Operations

A determined, planned effort is being made to explore the ground water potential at fish-cultural stations to supplement diminishing surface water supplies. As a result, additional water of good quality and temperature has been provided at a number of stations, and this work is continuing. The feeding of pelleted fish food was increased with promising results at many hatcheries. A program to make each region self-sufficient in fish egg production was initiated during the year with particular attention being given to desirable strains and species.

Federal Aid in Fish Restoration

This program, financed by the Federal excise tax on sport fishing tackle, provided \$4,705,000 available for the the States and Territories in 1959.

During the year, 164 investigative studies which obligated \$2,680,000, stressed the development of new or improved fish management techniques through evaluation of artificial reefs in coastal waters, selective poison baits for control of undesirable fish, game and forage fish stocking, the relation of sport and commercial fishery harvests, and electrical devices. Life history data collection was emphasized due to its basic importance to management. Findings of completed studies were made available in 19 bulletins and articles.

Habitat development work performed in 36 States, Alaska, and Hawaii, obligated \$2,054,000. Construction was initiated or completed on 33 public fishing impoundments, one-third of which exceed

100 surface-acres. Such waters receive heavy public use as is illustrated by the 4,800 anglers counted on one new lake during the first 4 days of fishing. Development of 99 fishing access sites opened additional waters to fishermen. Major improvements at these sites were access roads, parking lots, and boat launching ramps. Control or eradication of undesirable fish, control of noxious vegetation, installation of stream improvement devices, and construction of rough-fish barriers and fishways were undertaken to improve existing fishing conditions.

Land acquisition in 13 States obligated \$505,000. The 103 projects undertaken included 33 sites for stream and lake access, and 3 damsites and storage basins for future impoundments. Both fish and wildlife restoration funds were used to purchase 16 other dual purpose areas. More than 5,200 acres were added to existing State-owned management areas.

Federal Aid in Wildlife Restoration

Apportionments to the States and Territories for the year totaled \$16,526,000. The 221 investigational projects on which work was performed obligated \$4,590,000. Earlier research disclosed basic habitat requirements and management needs. However, administrators still need up-to-date estimates of game numbers, production, and harvest. Most States participated in such resource inventories. Pooling of talent and funds to attack regional problems gained wider acceptance. Findings were made available through publication of 381 articles, bulletins, and books.

Land management to accommodate more hunters and increase game harvests continued through work on 342 habitat improvement projects which obligated \$10,780,000. Decrease in food and cover plantings on private farm lands was offset by beneficial soil conservation measures. In contrast, greater expenditures were directed toward intensive development of publicly owned or managed lands. Game production responded favorably to selective cuttings, creation of forest clearings later planted to food crops, and development of dependable water supplies to effect better game distribution. Building of hunter access roads, parking lots, and supervision of managed hunts resulted in the harvest of surplus game in many heretofore inaccessible areas.

Future hunting for the average sportsman will depend largely upon expansion of opportunity on public lands. A total of 288 land acquisition projects obligated \$4,544,000 for the purchase of new waterfowl areas, wetland potholes scheduled for destruction



Bighorn Sheep—lambs, rams and ewes—trapped for transplanting to vacant range on a Federal Aid in Wildlife Restoration project.

through drainage, as well as upland game hunting areas, white-winged dove nesting habitat, and band-tailed pigeon concentration areas.

Fishery Management Activities

Providing technical assistance in the management of the many fine sport fishing waters under Federal ownership or control, either separately or in cooperation with the States, is an important Bureau activity. The 225 Federal areas providing management services during the past year have a combined area equal to that of Florida or Michigan. At least 1 million man-days of fishing can be credited to assistance rendered thereon.

Marked growth of interest in recreational fishing has been shown at the military installations. Moreover, public fishing programs are being inaugurated at some of them. Also, greatly increased interest has been demonstrated on the Indian reservations of the West. Fishing not only provides a recreational outlet for the Indians, but at some reservations the sale of permits and other services results in a sizeable income. At Fort Apache, Ariz., for example, over 100,000 daily fishing permits were sold to nonresidents of the Reservation in 1958.

Stream and pond surveys, fish population studies, and stocking recommendations were carried out on 12 National Forests in cooperation with the States. Other cooperative work included

the gathering of data and management measures applied to sport fishery resources of interstate waters, particularly on the Upper Mississippi River, the Lower Colorado, and the Roanoke River. Where coordination of interests and consolidation of manpower and equipment are advantageous to getting the job done, the Bureau endeavors to supply the necessary leadership. Cooperative agreements on fish stocking and other management activities were approved with several States. These agreements insure the most effective use of hatchery fish, and prevent duplication of effort between the agencies.

Fish Distribution

Production and distribution of trout and salmon from Federal hatcheries increased 13 percent, by weight, above any previous year. The production of warm-water species was slightly below the high level of the year previous as a result of increased attention being given to the production of predator fish needed in the management of warm water fish populations. During the 12-month period covered by this report, over 2 million pounds of fish in the following numbers were distributed: trout, 24 million; salmon, 100 million; and warm water species, 83 million.

Exotic Bird Introduction

Important progress is being made in the cooperative foreign game introduction program. The States are making ecological surveys of game-depleted areas, and the Bureau specialists conduct research on potential foreign game birds, arranging for the acquisition and shipment of birds whose living requirements are found to compare favorably with our vacant or under-populated habitats. Studies were made in western Europe, Japan, India and Afghanistan. Introductions included Reeves pheasants, Japanese green pheasants, red-legged partridges, bamboo partridges, gray francolins, and black francolins. Distribution is made on the basis of recommendations by the Exotic Game Committee of the International Association of Game, Fish, and Conservation Commissioners and the Bureau. This program is an excellent example of State and Federal cooperation toward increasing the Nation's wildlife resources.

Predator and Rodent Control

Agriculture is in the midst of a change comparable to the industrial revolution of 75 years ago. Mechanized specialization,

often on large acreages, requires an efficiency and specificity of animal damage control undreamed of a few years ago.

Forestry demands effective ways of controlling rodents which would otherwise delay reforestation from 1 to 10 or more years. In the Pacific Northwest, a year's delay results in a growth loss estimated at \$15 to \$18 per acre.

Other control problems, readily solved in sparsely settled areas where highly toxic control methods can be safely used, are vastly complicated by increasing human population and the resulting competition for land use. This greater intensity of land use calls for strenuous efforts by the Bureau to keep abreast of multiple demands for animal control in an increasingly complex world.



Rat control in and near grain elevators is an important part of Bureau cooperation with industry in the Clean Grain Program.

Success of the adjustment is attested by reports from benefited industries. Among livestock raisers of the Western States, losses by predators remain below 1 percent per year as compared to 10 to 15 percent before recent development of modern methods. Tree farmers throughout the Pacific Northwest are saving up to \$15 per acre in reforestation costs by using direct seeding which was recently made possible by Bureau-developed control of seed-eating rodents.

Rabies outbreaks in several places, including Arizona, California, the Dakotas, and Virginia, have been contained by joint efforts of public health agencies and the Bureau, which controlled wild animal carriers of the disease. Southern growers of truck crops, especially watermelon growers, have saved money and crops by using the Bureau's new methods for repelling rodents from newly planted seed.

The Bureau, in cooperation with State and other agencies, treated 4,960,000 acres to control rodent depredations throughout the country. Outbreaks of phenomenal numbers of cotton rats in Texas, and meadow mice in Oregon, California, Nevada, and nearby States were promptly attacked by emergency assignment of teams of Bureau specialists who worked with local officials in developing and using control methods to mitigate the rodent destruction. Methods for controlling depredations by nuisance animals and birds were demonstrated to groups of fruit growers and farmers during the year, and were the topic of many radio and television broadcasts in cooperation with the Extension Service. A rat control film was produced in conjunction with Purdue University, and 267 sets of colored slides were prepared and distributed.

Cooperative Wildlife Research Units

The 16 Units are administered cooperatively by the Bureau, the State fish and game departments, the Wildlife Management Institute, and the land grant colleges and universities at which they are located. These Units conducted research on 290 projects and sub-projects during calendar year 1958. Studies included some 55 species of birds and mammals, and covered a wide range of topics of interest to State and Federal wildlife managers. A total of 207 degrees were granted last year to wildlife students in Unit Schools, including 137 Bachelors', 57 Masters', and 13 Doctors'. This brings the number of degrees in the 23 years of Unit operation to more than 2,900.

Coordination Area Transfers to States

The State of Nebraska was granted the use for wildlife purposes of 2,550 acres of land, and the State of South Dakota 4,430 acres, at the U.S. Army Corps of Engineers Lewis and Clark Reservoir at Gavins Point on the Missouri River. These lands were made available to the Bureau under a General Plan and cooperative agreement, and were subsequently made available to the States by cooperative agreements between the Bureau and the two States. In

addition, two parcels of former Indian school lands, containing 693 acres no longer needed for that purpose, were reassigned to the Bureau and made available to Kansas and Minnesota under co-operative agreements.

Federal-State Law Enforcement Programs

The high degree of cooperation that has been reached between this Bureau and the State conservation departments has aided immeasurably in a better understanding of management problems and in the development of methods by which to solve such problems. Enforcement personnel of the Bureau commissioned as State deputy wardens made numerous arrests for violation of State game laws, thereby reciprocating for the assistance received by them from State wardens enforcing regulations established to afford protection to migratory birds.

Enforcement

At 6 a.m., on September 5, 1958, 41 Bureau Game Management Agents, from 11 States, together with game wardens from the 3 States involved, served warrants on 95 individuals in the States of Wisconsin, Michigan, and Illinois. This was the largest operation of its kind in the history of game law enforcement. The individuals named on the warrants were charged with killing and selling waterfowl contrary to Federal regulations. Evidence gathered over a period of 2 years by a Federal investigator revealed that the persons charged were actively engaged in trafficking in waterfowl.

Market hunting, illegal since 1918, has nevertheless continued to flourish in many areas of the United States by means of an almost fantastic network of carefully concealed operations. The undercover operations conducted by the Bureau, resulting in the mass arrests, were undertaken because of numerous complaints reaching the Bureau from sportsmen and others that market hunting had reached serious proportions in the areas involved.

Of the 103 individuals charged, 92 were convicted, one found not guilty, and the charges against six were dismissed. Three defendants died before being brought to trial, and one is a fugitive from justice. Fines and court costs assessed amounted to \$36,631.

During the period 1952 to 1958, undercover operations conducted by the Bureau have resulted in the arrest of 229 individuals found to be engaged in the killing and marketing of migratory waterfowl.



U.S. Game Management Agents examine waterfowl taken by five hunters in excess of legal limit; deer taken during closed season.

Recreational Use

There were over 9 million visitor-days of public use on the 270 National Wildlife Refuges in 1958. Wildlife observations, picnicking, swimming, and photography were the most popular with nearly $5\frac{1}{2}$ million, or about 60 percent taking advantage of these opportunities. Fishing by $3\frac{1}{3}$ million accounted for about 36 percent of the total. This sport showed nearly a 15 percent increase over the previous year. Hunting was enjoyed by 352,000 persons on 69 of the refuges. This included big-game hunting, primarily for deer where surpluses of these animals were available for harvesting.

The recreational use of National Wildlife Refuges increased nearly 170 percent between 1951 and 1958. Visitor use rose from 3.4 million to 9.1 million during this 8-year period. The annual increase in public use has shown some variation based primarily upon water conditions that affected fishing. On the basis of an average increased annual use of 23.6 percent in the past 8 years, it is reasonable to predict that there will be more than 17 million visitors on the refuges by 1968.

The extremely limited recreation facilities, many of which were constructed in the 1930's, have imposed unusual problems on refuge personnel. On many areas, expanded use will not be possible without provisions for further development and maintenance.

River Basin Activities

A structure to divert water from the Colorado River into the upper section of the Havasu Lake National Wildlife Refuge was completed by the Department's Bureau of Reclamation during this year. This diversion of water into the Topock Marsh east of Needles, Calif., was needed because the channelization of the river had greatly reduced fish and wildlife values. The diversion of water into this area permits the circulation of water through the marsh as planned by this Bureau, and thereby restores its former attractiveness to migratory waterfowl.

An accelerated program for the development of power sites in the Columbia River Basin could jeopardize the famous salmon and steelhead runs of the Columbia River and its tributaries. Concern about the effects of high dams proposed for that part of the Basin caused the Department of the Interior to urge the Department of the Army to defer planning and recommendations for the construction of any more dams in the Middle Snake River below the mouth of and including the Imnaha River until there is conclusive evidence that the extremely valuable migratory fish can be safely passed over high dams.

One of the most difficult fishery problems at high dams is that of safely passing downstream migrants. During the past year, skimmer devices were installed at the Pelton Dam on the Deschutes River and at the North Fork Dam on the Clackamas River, both in Oregon, and at the Brownlee Dam on the Snake River, Idaho and Oregon. Special studies were initiated at the Pelton Dam to determine the adequacy of these facilities for downstream migrants.

Sport and commercial fisheries of the Potomac River will be benefited by the fishway now being constructed by the Corps of Engineers at Little Falls Dam, a short distance upstream from Wash-

ington, D.C. The fishway, which was recommended by the Bureau and Maryland and Virginia fishery agencies, will open up about 10 additional miles of stream to anadromous fish and provide badly needed spawning and nursery area.

Water Rights

Management of 500,000 surface acres of impoundments on National waterfowl refuges using an estimated 1,500,000 acre-feet of water per year, and on 91 fish-cultural stations using nearly 300,000 acre-feet of water per year, makes this Bureau a major holder of water rights. To conserve and protect these rights, a water inventory program to assemble full and detailed information on the use of water for which rights have been acquired was initiated during the year. Geologic source of water, quality, quantity, kind, and period of use are recorded. The availability of these data will provide accurate information for use as needed in the continued operation of the fish and wildlife installations. The need for these factual data is highlighted by the trends in the enactment of water laws by the States under which water users are required to file technical information on the amounts and source of water in order to record vested rights to the use of specific quantities of water.

Fish and Wildlife Research

More food and greater opportunity for individual participation in wholesome recreation are important needs of a growing American population. The Bureau's fishery research is aimed at these long-term and continuing National needs by looking for ways to produce more and better fish in hatcheries and by devising methods for getting greater sustained yield of desirable kinds of fish from our natural and impounded waters.

Fisheries

Sport fishery research was carried on at 15 laboratories and field stations:

<i>Laboratory or station</i>	<i>Area of research</i>
Boothbay Harbor, Maine -----	Atlantic salmon restoration.
Cortland, N. Y. -----	Hatchery fish nutrition.
Leetown, (P.O. Kearneysville) W. Va. ----	Diseases and parasites of hatchery fish.
Gatlinburg, Tenn. field station -----	Appalachian sport fish management.

*Laboratory or station—Continued**Area of research—Continued*

*LaCrosse, Wis. -----	Fish population control.
*Denver, Colo., Gulf Breeze, Florida field station -----	Effects of pesticides on fish.
Logan, Utah, Yellowstone Lake field station -----	Rocky Mountains sport fish management.
Reno, Nev., Convict Creek, Calif. field station -----	Productivity of alpine lakes; variations in trout survival.
Entiat, Wash. -----	Fish cultural methods.
Willard (P.O. Cook) Wash., Hagerman, Idaho field station -----	Hatchery fish nutrition; histopathology of salmon.
Seattle, Wash. -----	Diseases and parasites of hatchery fish.

*New, established after mid-year.

Highlights of Research Accomplishments

Stream studies are contributing a better understanding of the importance of hatchery diets to the subsequent survival of stream-planted catchable-size trout, and to the nature and extent of conversion to natural feedings of such trout when placed in mountain streams.

Post-experiment surveys demonstrated that the earlier "reclamation" of two streams in the Department's Great Smoky Mountains National Park was successful. This involved experimental chemical treatment of the streams to remove unwanted species and restocking with Appalachian-strain brook trout. Abundant spawning and good survival augur well for sustained good fishing.

Experimental trout fishing regulations on four streams in the Great Smoky Mountains National Park have been evaluated; they have been well accepted, and have provided superb angling. They involve year-round fishing for fun only (all but trophy-size fish are returned to the water). This radical departure from tradition should, on the basis of experience to date, give increased angling opportunities to park visitors.

Holding young Atlantic salmon in screened live cars in salt water showed promise that methods for rearing the fish to a larger size before release can be developed for better survival and return.

A 5-year study of the fish populations in the Madison River system of the Department's Yellowstone National Park was completed this year, and points the way to substantial changes in management and regulations to improve fishing.

Followup to determine the effects of aerial spraying of insecticide for spruce budworm control in the Yellowstone National Park area

in 1957 showed that although the spray caused immediate severe reductions in fish food organisms, full recovery occurred in some of the streams in 1958. Chemical analysis of water, vegetation, and fish collected 2 months after the spraying, revealed that the insecticide had been carried as far as 55 miles downstream from the sprayed area.

Public Law 85-582, which directed the Secretary of the Interior to undertake a comprehensive study of the effects of pesticides on fish and wildlife, led to the development of new and joint laboratory facilities at the Denver Federal Center with the wildlife research staff. Program planning and staff recruiting were in progress at the end of the year.

In the field of trout disease research, fish tissue culture techniques were advanced; a promising drug was found for the control of kidney disease; and a rapid, reliable method was developed for detection of anemia. Through chemical analyses of trout blood, a start was made on the establishment of a diagnostic table for trout pathology. There are strong indications of relationships between blood component ratios and certain trout diseases.

Experimental evidence suggested that inclusion of certain raw foods in the diet of salmon in hatcheries is the principal mode of transmission of a chronic, infectious, debilitating disease. Changes in food preparation or feeding practices are indicated. Fish nutrition researchers established certain vitamin requirements for lake trout and Atlantic salmon. Both of these species are of particular interest in restoration programs through stocking of hatchery fish.

Nutrition experiments showed that by regulating calorie and protein intake, it is possible to reduce the protein in trout diets without disturbing growth and conversion rates. This opens up possibilities for reducing costs in hatchery feeding. In salmon nutrition research, a direct dependence of the protein intake on water temperature was established; specific amino acid requirements for chinook salmon were determined; an improved vitamin test diet was developed to furnish adequate protein intake to the fish in different water temperatures; and techniques for rapid amino acid assay of diet and tissue components were adapted for practical use.

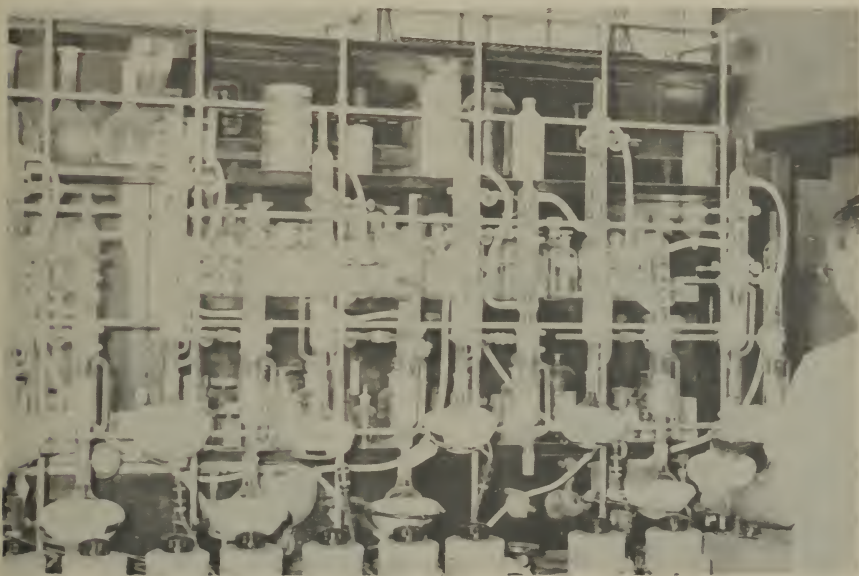
Experiments with controlled light demonstrated that maturation of salmon can be accelerated to reduce holding time and mortality and thus increase the egg take. With this finding, hormone injection experiments were discontinued.

Wildlife

As directed by the Congress in Public Law 85-582, the Bureau intensified its research on wildlife-pesticide relationships. Labora-

tory tests were continued on physiological effects of minute dosages of many insecticides, and field studies were carried on to determine the effects of control programs on the fire ant in the South, the Dutch elm disease in the North, and on grasshoppers in the Western States.

Bureau field studies disclosed heavy wildlife losses from the fire ant control program. Quail, rabbits, and ground-feeding song birds suffered severe losses and almost all species were affected. Robins are most vulnerable in Dutch elm disease control. Earthworms concentrate the toxicant in their tissues, and birds with a high earthworm diet are in special danger. Fear also has been expressed for the woodcock, and studies have been initiated on this species.



Equipment used at the Patuxent Wildlife Research Refuge to determine whether birds and mammals found dead in areas treated with pesticides contain lethal quantities of toxicants.

Research has demonstrated that bird losses in Dutch elm disease control can be diminished by use of mist blowers which reduce "puddling" under trees, by applying treatments before leaves appear in the spring, and by using methoxychlor instead of DDT in control of the bark beetles which carry the disease. Modifications of techniques and rates of application of pesticides are being sought in cooperation with the Department of Agriculture in order to reduce mortality to wildlife resulting from the fire ant control program.

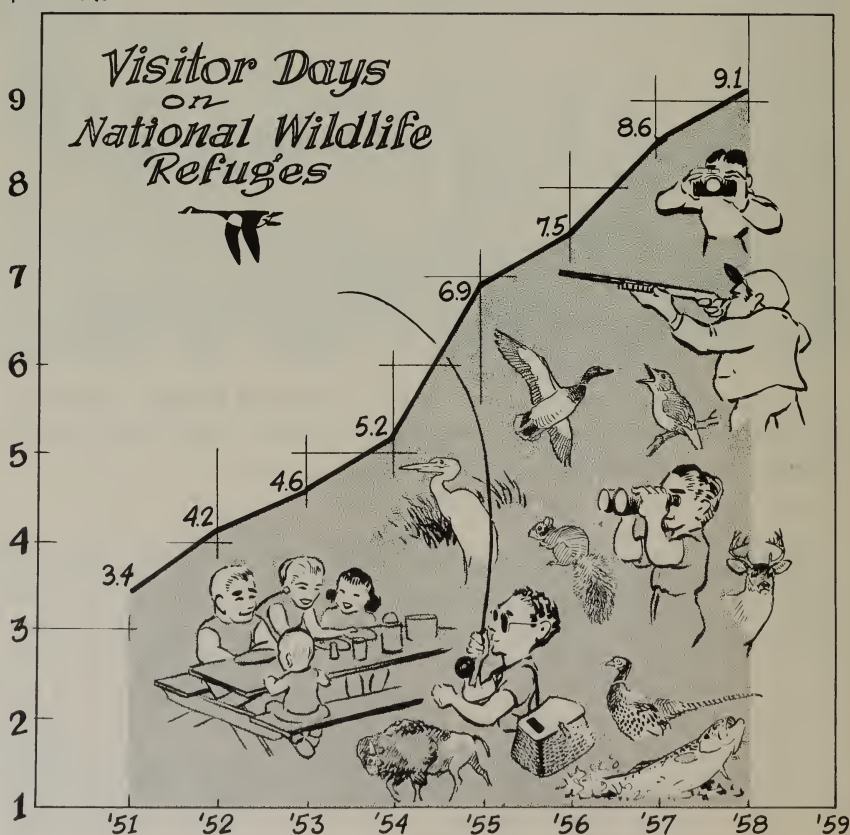
Forest-Wildlife Relationships

A biologist was assigned this year to cooperate with the U.S. Forest Service at Asheville, N.C., in research on forest wildlife production in relation to timber management. Problems under investigation include the effects of wildlife populations on forest reproduction, the effects of timber management upon wildlife, and the testing of specific management techniques for forest wildlife species. Similar problems are being studied in the Lake States, Colorado, Montana, Texas, and Utah. The effects of mice in preventing reseeding of forests is being studied in the Douglas-fir region of western Oregon, and new techniques for protecting seeds and seedlings are being developed.

Management of Waterfowl Areas

Production of waterfowl foods and the management of Atlantic coastal wintering areas are being studied in a cooperative project

millions



with Virginia and North Carolina in the Back Bay-Currituck Sound area. Encouraging progress has been made in analyzing factors responsible for food production and in developing techniques for improving these important waterfowl wintering areas.

Significant progress has been made in developing effective control measures for cattails, phragmites, and needlerush, all of which are important pest species in many waterfowl wintering marshes. Promising leads have also been developed on the control of two other important weeds—alligator weed in the Southeast and water-chestnut in the Northeast. Pest plant control and improved water management techniques which have been developed in research in Atlantic coastal areas make it possible to convert many types of lands that have previously been considered worthless for waterfowl into highly valuable breeding and feeding grounds for ducks and geese.

Mourning Dove Studies

The Bureau has expanded its research on mourning doves in cooperation with State biologists throughout the dove hunting regions. The management of the dove is complicated because of wide variations in production and migratory movements in its continental habitat. Preliminary banding studies have demonstrated that three units—Eastern, Central, and Western—can be delineated for the purpose of applying more effective management measures to such populations. Each of these units appears to produce some 95 percent of the birds killed within its boundaries, and about 95 percent of each unit's harvestable production is killed either within the unit or outside the United States. If further research bears out these preliminary conclusions, the designation of the three units will do much to clarify and help solve the Nation's complex dove management problems.

Research on dove diseases has been concentrated on trichomoniasis as the principal disease. A superficially similar disease, "fowl pox," which might readily be confused with trichomoniasis, has been demonstrated in captive doves.

Publication of Research Findings

Results of research by staff members appeared in numerous publications during the year. Among these have been books on the Birds of Georgia, the Birds of Maryland, and the Bobcat in North America. Approximately 60 shorter articles were published in various scientific journals.

Bureau of Commercial Fisheries

Donald L. McKernan, *Director*



MAJOR ACTIVITIES of the Bureau of Commercial Fisheries, a component bureau of the Department of the Interior's Fish and Wildlife Service, are the research and services provided to help in wisely and fully utilizing the Nation's fishery resources.

Industrial research ranges from explorations for new fishing grounds to technological work for determining better ways of utilizing the resources. In the field of industrial services, market news information is provided to industry, statistics are collected to show trends in production, studies are conducted on the economic problems of the fishing industry, and market development programs are provided to promote the wider use of fishery products.

Services in international trade and tariff problems have become another significant phase of the Bureau's activities. The Saltonstall-Kennedy Act has continued to provide funds to assist the domestic fisheries, with emphasis on research and marketing.

The Bureau's exploratory fishing vessels made important commercial discoveries during the year. Concentrations of bluefin tuna were discovered in January in the Gulf Stream area of the western North Atlantic by the vessel, *Delaware*. This discovery has added much to the limited previous knowledge of the seasonal distribution and commercial potential of bluefin in those waters. Large concentrations of shrimp were found to be available in Central Alaskan waters; the exploratory vessel, *John N. Cobb*, located commercial quantities of this resource in the lower Cook Inlet, the southeast side of Kenai Peninsula, and in the Kodiak Island areas.

Investigation of midwater and surface-schooling fish in the Gulf of Mexico by the *Oregon* indicated that at least six little or non-utilized species are present in possible commercial quantities. Experiments with several types of gear are under way to determine the most practicable method of capturing these fish. The *Oregon* also

conducted explorations for shrimp on the high seas off the coast of northern South America. Principally because of these explorations, a fleet of U.S. shrimp trawlers moved to the area to fish on a trial basis.

Successful development and testing was completed of air-bubble equipment designed to direct herring (Maine sardines)—from areas inaccessible to conventional gear—into accessible areas where the fish can be caught easily. Electrical fishing methods were also tested in conjunction with conventional gear used to catch the herring.

The Fisheries Loan Fund Program, which was authorized by section 4 of the Fish and Wildlife Act of 1956, was continued during the year. Loans are made for financing and refinancing operations, maintenance, replacement, repair, and equipment of fishing gear and vessels, and for research into the basic problems of fisheries.

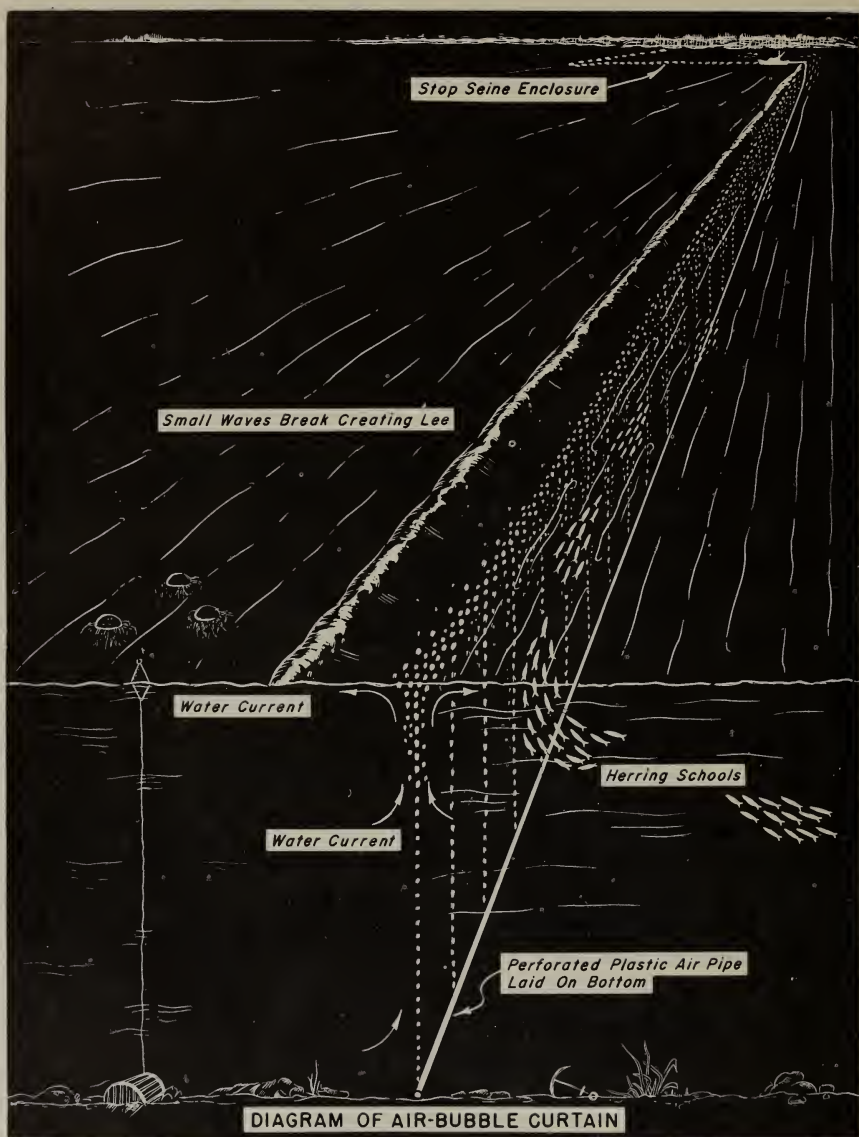
New applications for 140 loans under the Fund, totaling \$2,800,000, were received during the year. At the beginning of the fiscal year, the backlog of cases being processed or deferred at the request of the applicants was 63, and at the end of the year 23. Eighty-five applications were approved for \$1,900,000, and 80, totaling \$1,700,000, were declined or found to be ineligible. Fifteen applications were withdrawn before a final decision was reached. It has been estimated that the present annual catch of vessels receiving loans is about 230,000,000 pounds, or 5 percent of the total U.S. catch.

The Bureau has also worked on programs to reduce accidents to fishermen at sea. A Port Safety Committee for fisheries in Portland, Maine, was formed through the efforts of the New England Fisheries Safety Program; the Committee is the first of its kind in the United States. Other New England ports will be assisted in forming such committees.

The fishery-product inspection program of the Bureau is 1 year old; it furnishes continuous inspection services to 23 processing plants, and has certified approximately 75 million pounds of processed fishery products. Approximately 60 different products are inspected on the basis of approved product specifications.

Besides plant inspection, offices in four major cities furnish lot inspection services to State, Federal, institutional, and private purchasing agencies. To date, five voluntary U.S. standards for grades have been promulgated and are in use; four additional standards are in the final stages of preparation.

Research in fish oils during 1958 has been diversified and exceptionally successful. It was found that fatty acids derived from fish oils have potential medicinal use since they markedly depress the high blood-serum cholesterol levels associated with the Nation's No. 1 killer—atherosclerosis. Fish oils have also proven to be of use



The air-bubble curtain was developed by the Bureau of Commercial Fisheries to guide herring to areas where they might be captured by conventional gear.

in iron-ore concentration and in the dressing of hides into certain leathers. Other studies have developed very effective agents which have extended, by a factor of 15 times, the storage life of antioxidant-treated fish oils. Techniques have been perfected for detecting and identifying metallic impurities in fish oils.

Finally, a review has been published of the world's scientific literature on intermediary metabolism in fishes; this is the first work of its kind and may lead to a better knowledge of the mechanisms of oxidation of fish oils, a longstanding problem for fish processors.

During the past year, conclusive scientific studies proved the value of adding fishmeal to commercial animal feeds. Broiler chicks fed fishmeal and fish solubles showed a weight gain 16 percent greater than broilers fed a comparable all-vegetable protein diet. This added growth is attributed to the completeness and digestibility of fish protein, as well as to the presence of vitamins and of as yet unknown growth factors.

The cost of fishing or the cost of production, as the term is generally used, has a specific significance in many segments of our fishing industry, and has been studied by Bureau economists for the benefit of our domestic fishermen. Tuna and groundfish producers, in particular, face intense competition from foreign producers who export their products to the United States.

The San Diego State College Foundation, under a research contract, is reporting on costs in the albacore industry in relation to areas fished, the types of vessels employed, and other factors of special significance in determining the competitive status of the industry. Another similar contract report is in preparation by Boston College on the New England groundfish industry. The University of Washington is analyzing the economic effects on the halibut industry of government-imposed controls on catch, as well as the industry's program of voluntary layover of vessels between fishing trips.

Studies were conducted on transportation problems in the industry, including a study of the importance of "exempt" trucks. Work continued on records of parity prices to show the relative economic prosperity or depression of various segments of the industry, on the long-term outlook for production and consumption of fishery products, and on the relation between capital and labor used in the fisheries. In the field of consumer research, a special study was undertaken to provide information to the industry on reaction or motivation in consumer buying habits for canned fishery products.

The Bureau's representatives inspected 14 fishery cooperatives to check compliance with the Fishery Cooperative Marketing Act of 1934, and to obtain statistical information on activities. Four new fishery cooperatives were organized during the fiscal year.

Members of the industry—fishermen, buyers, and distributors—were aided in determining the current market for fresh, frozen, and canned products by information published daily in the Market News Service's Fishery Products Reports. Marketing specialists located in Boston, New York City, Hampton (Va.), New Orleans, San Pedro

(Calif.), Seattle, and Chicago collected and distributed data on landings, receipts, stocks, imports and exports, market conditions, and prices for all types of fishery products. Fifty port reporters in the principal fishing and distributing centers of the Nation continued to collect data for daily reports; these reports show the trends in marketing all over the world.

The monthly periodical, *Commercial Fisheries Review*, in its 21st year of service to the industry, presented special articles and news on progress in all phases of fishery research in the United States and abroad.

In line with its responsibility for promoting the use of domestically produced fishery products and in an effort to develop the fullest and wisest use of our fishery resources, the Bureau conducted an aggressive and effective market development and consumer education program. This nationwide program was designed to expand traditional markets and to create new market demand for U.S. fishery products.

To obtain special information on distribution and consumption patterns of various fishery products, the Bureau let a number of market research contracts to private research firms and Government agencies. This information should prove of value to industry and Government in the planning of marketing programs.

Consumer-education efforts were timed to coincide with periods of greatest promotional activity by industry. Recorded radio spot announcements and television drop cards and slides, dealing with the nutritional value of fishery products, were given wide distribution. Two million fish and shellfish recipe folders were distributed through retail food outlets, and educational material and tested fish recipes were made available to such mass feeding bodies as schools, other institutions, in-plant feeders, and restaurants.

The Bureau's home economists presented 193 fish cookery demonstrations, appeared on 66 television and radio food shows, and participated in 5 national food trade conventions.

Sixteen fishery educational films are in distribution through some 160 film libraries and Government distribution channels; they have an annual audience of well over a million persons, exclusive of television viewers. Two industry-financed motion pictures are now being made and agreements have been signed for the production of two others.

The use of "rough" fish for animal food—successfully developed during pilot research efforts in the Lake Erie area—is being expanded. New markets are being found in inland and coastal areas where rough-fish problems exist.

Detailed statistical surveys on employment in the fisheries, volume

and value of the catch, and the production of manufactured fishery products for 1957 were completed for all sections of the United States. Similar surveys for 1958 were undertaken, and completed for some areas. The Bureau also published a detailed statistical review of the 1958 fisheries of the United States and Alaska. Data were assembled on the U.S. catch and its disposition for publication in the Food and Agriculture Organization's Yearbook of Fishery Statistics for 1958.



Specialists demonstrate fish cookery and publicize standards and inspection program on popular television cooking show.

Economic and biological data on landings of fish and shellfish in the North Atlantic, and of shrimp in the South Atlantic and Gulf areas, were made available to research workers. An historical report was prepared on the United States tuna fishery. Detailed boat operating unit data were compiled for Atlantic and Gulf purse-seining for menhaden and otter trawling for fish and shrimp.

Monthly reports continued to be issued on the following subjects: landings of fish and shellfish in 14 coastal States and in Ohio; freezings and holdings of frozen fish; production of fish meal and

oil; foreign trade in fishery commodities, and quarterly production of fish sticks and portions. Monthly summaries—based on items which account for over 90 percent of the domestic production from the U.S. catch—were released.

Developments in the fisheries of other countries are continuing to have a profound effect on the U.S. fishing industry. These effects were closely followed during the year. Background papers and reports on trends and developments in the fisheries of overseas countries were prepared for the information of other Government agencies, the Congress, the trade, and the general public. In many cases, these reports were the result of direct requests to the Bureau for specialized information.

A series of reports on overseas fishery developments was started with accounts of two major developments in 1958—the expansion of the U.S.S.R. high-seas fisheries and the expansion of Japanese fisheries based in overseas areas.

A formal agreement to bolster and expand a foreign reporting program was signed by the Department of the Interior and the Department of State. The agreement spells out the responsibilities of each Department in the selection, assignment, and duties of attachés. Fishery attachés are now stationed in Mexico City and Tokyo. The objective of this program is to achieve worldwide coverage of foreign fishery developments of importance to the U.S. fishing industry.

The Bureau has expanded its studies on international trade and tariff problems as they affect the domestic fisheries. It has worked particularly towards the liberalization of import restrictions on U.S. fishery products. In the course of the year, restrictions were lifted by the United Kingdom on all kinds of canned fish from the dollar area. Bureau observers participated in meetings held by the Organization for European Economic Cooperation to examine the fishery policies of Western European countries with a view toward improving the production and marketing of fishery products. A report was published describing the relation of the newly established Common Market to the U.S. fishing industry; our present large exports of fish oils to Western Europe may be seriously affected by future Common Market tariff rates.

Biological Research

Biological research on the fisheries has developed rapidly in recent years, in America and throughout the world. It now involves many highly specialized areas of the life sciences and related regions of

physical science. The following summary of recent biological research of the Bureau of Commercial Fisheries is presented below:

Shellfisheries

Commercial shellfish research seeks to control predators and disease, provide a favorable fishery environment, and improve methods of fish culture so increased production will result.

The fungus disease *Dermocystidium* causes serious oyster mortalities along the Atlantic coast from Virginia to Texas. To develop an oyster population which will resist it, fungus-resistant South Carolina oyster seed have been transplanted to Florida.

Some New England hard clams were found to grow four times as fast in Florida waters as in New England waters while others grow at least twice as quickly.

Tests at Boothbay Harbor, Maine, and Pensacola, Fla., show lindane-treated bait will control green crabs which prey on hard clams. Clam survival was higher and green crab populations lower in the protected areas than in the unprotected ones.

Studies in Oyster River, Chatham, Mass., show oysters grown on rafts grow faster and are healthier than those grown on bottoms. The oysters suspended below a raft are expected to reach marketable size by the fall of 1959, when they will be two years old. If they had been bottom-grown instead of raft-grown, they would have required four or five years to reach that size. The mortality of raft-grown oysters was 17 percent in 1958 and over 90 percent in bottom-grown oysters.

Studies are being made to determine the amount of radioactivity which man may acquire from eating marine fish and shellfish. Strontium 90 does not concentrate in edible portions of seafoods since it is deposited in the shells. Cesium 137 accumulated slightly in edible portions and, thus, may be one of the more important fission-product contaminants of seafoods. Other fission products are taken from the water only to a limited extent and do not impart a high radioactivity to seafood organisms.

Fish and shellfish concentrate radioactive metal ions to high levels. Although present in marine waters in small amounts, these contaminants are passed through the food chains to seafoods. The uptake and the accumulation of zinc 65 and cobalt 60 are being measured.

The heavy oyster setting in Long Island Sound in 1958 did not significantly increase the oyster resources because drills and starfish killed most of the young oysters soon after they had set.

Commercial oyster set may be obtained from artificial salt-water ponds. In an artificial pond on Long Island, successful sets of American oysters were obtained by releasing, ready-to-set larvae in the pond. Light sets of European oysters, *Ostrea edulis*, and Japanese clams, *Tapes semidecussata*, also were obtained in this pond.

Methods for controlling enemies and competitors of juvenile oysters and hard-shell clams grown under hatchery conditions at Milford, Conn., were developed. Certain vital dyes, a saturated salt solution and chemicals controlled and often eliminated fouling organisms, such as hydroids, tunicates, worms and mussels. Sulfa drugs, antibiotics, fungicides and temperature manipulations protected young mollusks from diseases.

Studies at the Milford, Conn., Laboratory indicate that creating chemical barriers around shellfish beds to prevent enemies from entering them may be effective, especially against predacious gastropods, such as oyster drills, *Polinices*, *Busycon*, and others.

The Annapolis, Md., and Franklin City, Va., Laboratories developed a promising method of controlling the movement of the drills *Urosalpinx* and *Eupleura* which prey on oysters. This method consists of erecting around an oyster bed a low plastic screen fence with a strip of copper attached to it. Since drills will not cross this copper strip, they do not enter the oyster bed. In a field test of this method in 1958 on a half-acre plot, 75 percent of the oysters survived while nearly all oysters in a nearby unprotected area were lost.

Anadromous Fisheries

The populations of anadromous fishes can be made more productive than they are because they spend part of their lives in fresh water. Streams can be improved, pollution abated, better fishways built and adequate spawning escapements permitted. The Department's Fish and Wildlife Service, as research agency of the Atlantic States Marine Fisheries Commission, continued observations on the Hudson River and the Connecticut River shad populations. The Connecticut River population is approaching its 1941-46 size when the best recorded catches were made. This increased population abundance resulted from an increased number of shad which were allowed to escape the fishery and spawn. The fishway on the Connecticut River at the Hadley Falls Dam, Holyoke, Mass., passed a record number of shad during the 1959 shad run.

Research on managing the Atlantic coast shad resources centered on the St. Johns River, Fla., during the 1958-59 shad run. Through use of catch, effort and tagging data a method was devised to



A plastic tag is inserted in the cheek of a 2-year-old Passamaquoddy herring.

determine the shad population in this river for each year in which such data are obtained.

Dams and pollution in the Roanoke River, Albemarle Sound, N.C., threaten sustained abundance of the striped bass population. To resolve these problems, a cooperative study for developing this river basin by scientific means began in 1955. Research on the population and spawning status of striped bass in Roanoke River in relation to industrial development and water released from power dams upon the spawning grounds has been completed.

In the spring of 1959 the Bureau, Maryland and Virginia concentrated research on striped bass on Chesapeake Bay. They tagged 2,200 striped bass in the Potomac River as a part of the research planned to determine seasonal, annual and age-specific migrations, estimates of population size and mortality rates, size and age-class composition and homogeneity of races.

In California and the Pacific Northwest, research on behavior patterns and survival of fish under extremes of environment is designed to understand fluctuations in abundance of the coastal stocks. Basic and developmental research is directed toward the safe passage of fishes at water-use projects.

Research for the International North Pacific Fisheries Commission, formed by Canada, the United States and Japan, has progressed steadily. Two chartered vessels completed 78 gillnet sets in the North Pacific and Bering Sea during the spring and the summer of 1958. The catch of 5,462 salmon included 1,190 reds, 3,877 chums, 194 pinks, 175 silvers and 26 kings. Compared with the catches in 1957, catches in 1958 reflect a marked decline in the abundance of pinks. Chums were in comparable numbers both years.

The widespread salmon sampling program throughout the North Pacific Ocean and adjoining seas and coastal areas featured increased sampling coverage off the Asian coastline. Red, chum and pink salmon samples collected by the United States, Canada and Japan for racial studies totaled 21,632 whole salmon and 2,319 salmon blood samples.

The second season of experimental work on guiding seaward migrant fingerling salmon with electricity at the Lake Tapps field site is in progress. Results show at least 90 percent of the yearling and 2-year-old coho salmon moving through the area are diverted into bypass traps by the electrical barrier which is operating at an economic power consumption level. These findings also indicate the probability of future reductions in electrical and mechanical instrumentation and show that under certain circumstances electricity can be efficiently used to divert migrating fingerling salmon.

Comparisons of the performance of salmonoids in experimental "endless" fishways indicate that pool-type fishways having a slope steeper than the commonly accepted 1-on-16 may be feasible, provided proper hydraulic conditions are obtained in the steeper slope. These experiments were conducted at the Bonneville Dam Fisheries-Engineering Laboratory on the Columbia River and utilized adult migrating salmon and steelhead trout which were passed through test fishways with slopes of 1-on-8 and 1-on-16.

Surveys of the Yakima River system indicated the chinook salmon escapement in 1958 was slightly less than half that in 1957. The downstream migrant trapping project at Prosser resulted in counts of 145,000 chinook and silver salmon from April 1 to June 1, 1959. Surveys above Rocky Reach Dam indicated fish passed Rocky Reach Dam through temporary fish passage facilities without noticeable deleterious effects.

In Alaska, efforts are being made to predict the number of adult salmon which will return from the Pacific Ocean to the streams to spawn. Pink salmon fry in Southeastern Alaska and in Prince William Sound were dyed with neutral red stain, released and trapped downstream. In the Bristol Bay area, the commercial catch was sampled for age composition, adult red salmon were

enumerated from towers and downstream migrating red salmon smolts enumerated with fyke nets.

Studies to determine the fresh-water survival of salmon in Alaska continued. At little Port Walter a count was made of upstream migrating adult pink salmon and downstream migrating fry. Experiments with young pink salmon in the stream gravel were conducted to measure their survival rate. Research at Brooks Lake concerned the factors affecting the survival of red salmon in the lake.

Inland Fisheries

To save lake trout and other fish from the predatory sea lamprey and, therefore, restore the livelihood of many fishermen, research and test control measures were continued against the lampreys. Success in developing and testing selective toxicants that destroy lamprey larvae without significantly harming fish and other aquatic organisms made possible full-scale chemical control operations in streams tributary to the south shore of Lake Superior throughout the year. By the end of the year the toxicant had been successfully applied to half of the United States tributaries that will require treatment. To achieve this, advance operation of electrical barriers that block the spawning of lampreys was reduced on Lake Michigan. Barriers are still operated on Lake Superior to prevent lamprey reinfestation of treated tributaries and to provide a measure of results from chemical control. The lamprey research and control program is carried out under agreement with the Great Lakes Fishery Commission, established by treaty with Canada in 1956.

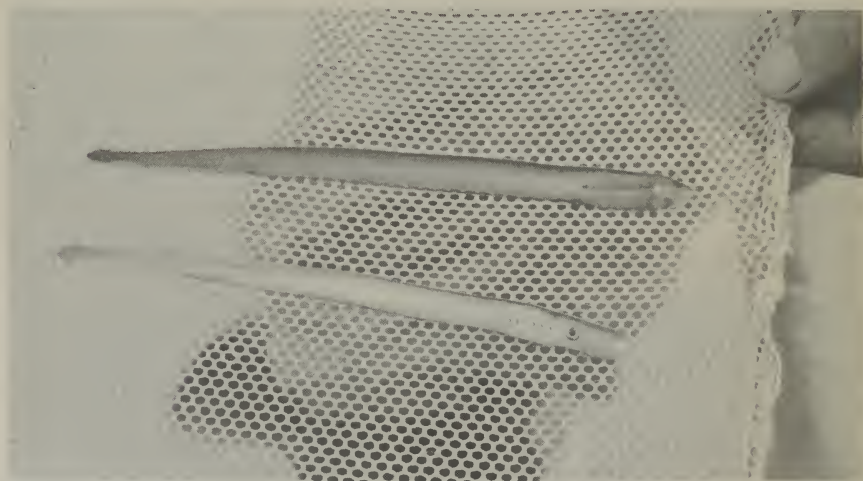
Floating tower used to count red salmon migration on Egegik River.



Marine Fisheries

Research on marine resources encompasses the waters of the Atlantic Ocean from the Grand Banks to Florida, the entire Gulf of Mexico and the western and central Pacific Ocean. These studies, aimed toward obtaining maximum continuing yields from the ocean fisheries, include not only investigations of the biology of the more important commercial species but also research on the oceanographic environment. Fluctuations in ocean currents, sea temperatures and fertility of the waters appear to account for major, and sometimes catastrophic, fluctuations in some sea fisheries.

Studies of sea surface temperatures, conducted at Stanford, Calif., for the period 1936 to 1958 show that water temperature along the West Coast and in the Gulf of Alaska increased by more than 2° F. and in some regions by as much as 8° F. between June 1956 and June 1957. This change was accompanied by a remarkable recovery of the California sardine during the fishing season of 1958 and a phenomenal increase in the sport fish catch of barracuda and yellowtail in 1957, with good catches much farther north than in many years. In the western and central Pacific, sea surface temperatures decreased a comparable amount.



Sea lampreys that have been killed by a selective toxicant: *above*, larva before transformation has started; *below*, an individual that is just completing transformation to the parasitic stage.

Studies to determine the need for conserving the eastern Bering Sea king crab stock centered on growth, abundance, effects of fishing and relations of distribution and abundance to environmental con-

ditions. Abundance estimates have been developed and tagged crabs released to provide information on mortalities.

New England groundfish investigations indicate that the international regulation $4\frac{1}{2}$ -inch mesh is effectively saving young haddock. The entrance of one or more large year classes of small cod on the fishing grounds, a size category absent in recent years, demonstrated that the $4\frac{1}{2}$ -inch mesh is also an effective savings-gear for this species. An estimated more than half million small cod, which would have been caught by the preregulation small mesh, escaped to be caught at a larger size.

The fate of cod eggs spawned off the mid-Atlantic coast is being investigated by drift bottles, dropped from United States Navy blimps in February 1959. Recoveries of tagged yellowtail flounders indicate three New England stocks are to be considered in management recommendations. These taggings have also delineated seasonal movements and promise to provide estimates of fishing mortality. Studies to clarify the taxonomic relations of three recognized groups of North Atlantic redfish will materially assist in consideration of international management recommendations for this species.

Research on the New England scallop fishery demonstrates that a substantial increase in scallop yield would have resulted if a $4\frac{1}{2}$ -inch ring had been in use in scallop drags on Georges Bank in 1958. Adoption of a larger ring was considered by the International Commission for the Northwest Atlantic Fisheries in June 1959.

Menhaden investigations show that variations in year brood abundance account in part for fluctuations in the catch in different areas. Increased fishing effort, accompanied by a progressive decline of the older age groups and a greater dependency upon individual year broods during the past two seasons, suggests that the fishery along the entire Atlantic coast may be subject to further decline below the 1957 and 1958 season unless reinforced by a very abundant 1958 year brood.

Recaptures of stained shrimp released in Florida and Texas waters show Florida Bay and the waters of the Department's Everglades National Park are important nursery areas for young pink shrimp. Stained shrimp from the Everglades National Park, recaptured 4 months later in the Tortugas pink shrimp fishery, had tripled their weight and traveled more than 100 miles. Those recaptured in Galveston Bay traveled up to 25 miles a week.

Studies of the Gulf industrial fishery utilizing species for pet food, fish meal and oil show the heaviest fishing occurs in Mississippi Sound and off the Mississippi River delta in waters less than 20 fathoms deep. A total of 104 species comprising 55 families con-

tribute to this fishery. Croakers, spots, white trout and porgies account for about 75 percent of the catch. Several plants operate throughout the year.

Intensive hydrographic and plankton surveys in Tampa Bay and adjacent waters during the past year show that the fish-killing red tide organism, *Gymnodinium breve*, is more abundant in off-shore waters than in estuarine areas during the winter. Laboratory studies of tolerance limits of the red tide organism indicate that salinity does not reach a sufficiently high concentration to limit its occurrence in the open waters off the Florida coast, but that low salinity may limit the organism's distribution in estuarine areas.

Tuna research in the western and central Pacific revealed that surface temperatures in some of the fishing areas were as much as 8°-10° F. colder than those observed during the summers of 1955 and 1956. The productivity of these areas, as evidenced from standing crops of plankton and forage organisms, was considerably reduced from that observed during previous years. Experimental fishing did not produce the yields predicted from earlier surveys in 1955 and 1956. Studies in French Oceania waters show the rate of sighting of skipjack and yellowfin reached a peak during January

Seining fry from a brood tank at the Bureau of Commercial Fisheries' tilapia rearing plant on the island of Maui. Fry-holding tanks may be seen along either side of the brood tank.



and March. Skipjack larvae abounded in the Marquesas area during January to March.

To alleviate the natural bait shortage in Hawaiian waters, the Honolulu Laboratory successfully used *Tilapia* and the Marquesan sardine. The 150,000 Marquesan sardines which were introduced in waters near the island of Oahu between December 1955 and March 1959 are successfully reproducing.

Two subgroups of herring in the Gulf of Maine have been demonstrated by the use of fairly new techniques: serology and parasitology. Tagging in the Passamaquoddy Bay area of over 100,000 herring show they move freely throughout the Bay area. Otolith (ear bone) studies indicate fall-spawned fish comprise the bulk of the landings.

Alaska Commercial Fisheries

In 1958, the commercial fisheries of Alaska, including the fur-seal byproducts industry of the Pribilof Islands, yielded products totaling 214,009,888 pounds having a wholesale value of \$83,148,351. Comparable production for 1957 was 200,359,388 pounds valued at \$79,472,050.

Alaska's pink salmon fisheries produced the best pack of this species since 1949, reflecting the results of a 4-year fishery rehabilitation program in the important pink salmon producing areas of Southeastern Alaska and Prince William Sound. At the same time, the production of red salmon was the smallest on record as a result of a weak run in the major red salmon producing area of Bristol Bay. Salmon products of all species totaled 154,543,000 pounds,

Production and value of canned Alaska salmon, 1925-58.





Fish passage facilities on the east bank of the Deschutes river at Pelton dam include the upper portion of the 3-mile-long fish ladder and downstream migrant holding structure in foreground.

valued at \$71,847,000, as compared with 135,849,000 pounds valued at \$68,157,000 in 1957.

With regard to other species, there were declines in the production of herring, sablefish and clams as compared with 1957, while landings of halibut and shrimp increased. Sablefish production dropped from 3,548,000 pounds in 1957 to only 1,093,000 pounds in 1958, while increased landings of shrimp upped the production of this species from 700,000 pounds in 1957 to 1,266,000 pounds in 1958.

There were 20,614 persons engaged in the fisheries of Alaska in 1958, of which 12,136 were fishermen, 1,108 were transporters and 7,370 were shoresmen, employed in connection with 157 wholesaling and manufacturing establishments. In 1957 comparable totals were 23,130 persons engaged in the fisheries, including 12,203 fishermen,

1,294 transporters and 9,633 shoresmen employed by 170 concerns. Of the 157 operating concerns in 1958, 48 were engaged in handling fresh and frozen fish and shellfish, 47 in curing fish, 89 in canning fish and shellfish, and 7 in manufacturing byproducts.

Fishing gear used in the Alaska salmon industry in 1958 included 243 traps, 1,193 purse seines, 340 beach seines, 5,309 gill nets, 32,376 salmon troll hooks, and 5 fish wheels.

In addition to 49 permanent personnel, the Bureau employed 263 seasonal streamguards in 1958 to supplement the enforcement program. A total of 6 seagoing vessels and a fleet of smaller boats was used in the administration of the fisheries. A fleet of aircraft including 6 twin-engine Grumman Goose planes and 3 single engine planes was operated in support of enforcement as well as fishery research activities.

Events stemming from approval of the Alaska Statehood Act on July 7, 1958, will bring about the transfer of jurisdiction over the fisheries of Alaska from the Federal Government to the new State effective January 1, 1960. With the advent of statehood, the Alaska commercial fishery regulations issued by the Department of the Interior on March 13, 1959 included a general prohibition of the use of salmon traps, to reflect the wishes of Alaskans in the disposition of their natural resources. In recent years these traps have taken 25 to 40 percent of the total Alaska salmon catch.

Columbia River Fisheries Program

The accelerated development of the waters of the Columbia River for power, navigation, flood control, and irrigation continue to pose complex problems in connection with maintenance of the salmon and steelhead runs. In addition to new research results from studies concerning passage of fish at high dams, considerable experience was gained during the year from the operation of fingerling trapping devices at several high dams in the Columbia Basin. The demonstrated efficiency of these facilities must be based on the success of the returning adult fish several years hence.

A review report was completed for the Columbia River Fisheries Development Program summarizing the results of the Program to date and including recommendations for future activity. Some 1,200 miles of streams have been improved through removal of barriers, such as log jams and splash dams, 15 major fish ladders have been constructed, over 400 fish screens have been installed, and 20 hatcheries have been rebuilt or newly constructed since inception of the Program in 1949.

The report contains the recommendation that further hatchery construction be deferred pending determination of the effectiveness of the existing hatcheries and that, for the present, new projects be directed toward stream improvement, particularly in the upper portions of the basin, and toward research, especially in regard to fish disease, nutrition in hatcheries, fish passage at high dams, and appraisal of program results.

Pribilof Islands Fur Seals

During 1958, the U.S. Government-operated fur sealing industry of the Pribilof Islands, Alaska, produced 78,919 fur sealskins, 15 percent of which were delivered to Canada and 15 percent to Japan in accordance with paragraph 1 of Article IX of the Interim Convention on Conservation of North Pacific Fur Seals. An additional 375 sealskins were delivered to each of those countries under paragraph 3(a) of Article IX of the Convention. The fur seal industry also produced 317.7 tons of seal meal and 53,160.5 gallons of oil.

During fiscal year 1959, two public auctions of fur sealskins were held in St. Louis, Mo. The Government realized total gross receipts of \$2,824,332 from the sale of 46,388 sealskins. In addition, sales by competitive bid of fur-seal oil and meal brought \$60,201, f.o.b. Seattle. Total estimated obligations for administration of the Pribilof Islands and the fur seal industry, including biological research, are \$1,825,000, resulting in an excess of receipts over expenditures of about \$1,060,000 for fiscal 1959.

During calendar year 1958, the Bureau chartered three fishing vessels to initiate a fur-seal research program at sea. A total of 7,024 seals were seen and 1,503 were collected between the latitude of southern California and Bering Sea.

Office of the Administrative Assistant Secretary

D. Otis Beasley, *Administrative Assistant Secretary*



THE ADMINISTRATIVE ASSISTANT SECRETARY is responsible to the Secretary of the Interior for the direction and supervision of the administrative management activities of the Department, including the development of policies and objectives relating to administrative management.

The Office of the Administrative Assistant Secretary is made up of seven divisions: Administrative Services, Budget and Finance, Inspection, Management Research, Personnel Management, Property Management, and Security. Highlights of the varied activities of the Office during the past year follow:

Division of Administrative Services

Floyd E. Dotson, *Director*

The Division operates centralized service facilities for the Office of the Secretary and other departmental and bureau offices in the Washington metropolitan area, and provides staff guidance in the field of administrative services for the entire Department. In fiscal

1959, work load and responsibilities remained approximately unchanged from 1958. Accomplishments during the year included:

(1) A new merit promotion plan was developed and installed in line with the government-wide program.

(2) Paperwork improvement studies continued, with Division employees actively engaged in a variety of employee training programs.

(3) Selective job classification surveys were conducted in various Departmental Offices.

(4) Installation of new lighting in the Central Library reading rooms raised the light level while reducing power costs 42 percent.

(5) Expenditures from all funds amounted to approximately \$9,000,000 and operations financed under the Working Capital Fund totaled \$1,800,000.

(6) An extensive modernization program for the Department Museum was launched, with immediate benefits in visitor understanding and interest; existing dioramas are being up-dated, and more use is being made of action-type exhibits.

(7) Continued development and application of records disposal techniques resulted in the destruction of more than 1,500 cubic feet of surplus documents.

Division of Budget and Finance

Sidney D. Larson, *Director*

The Division of Budget and Finance provides staff supervision over the financial management program of the Department of the Interior. This includes budgeting, accounting, auditing, financial reporting, fiscal policies and procedures, and the application of data processing to financial activities. The Division represents the Department in this field in liaison with the General Accounting Office, Bureau of the Budget, Treasury Department, and other Federal agencies, and appropriation committees of Congress.

During the past year regular budgets were processed for the Bureau of Reclamation and the Power Marketing Agencies and for the other bureaus, in addition to two supplemental budgets. A new format was developed for presenting appropriation estimates to

Congress designed to present requirements in a concise and more readily understandable manner.

Special analyses of increased pay costs were made for the Bureau of the Budget and the Congress and work continued on coordinating the bureaus' budget structures with their organization patterns. Instructions for the preparation of estimates to the Bureau of the Budget and Congress were published in manual form. The Division cooperated in developing legislation designed to place the programs of the Power Marketing Agencies on revolving-fund bases.

Efforts were continued to improve the accounting and financial management systems of the bureaus of the Department. Effective as of July 1, 1959, the Bureau of Land Management converted to an accrual basis of accounting. The Geological Survey submitted to the Comptroller General for approval an integrated procedure covering personal services, payroll and leave accounting. For other bureaus, the year's program involved a continuation of the improvement of their financial management programs in cooperation with the Bureau of the Budget and General Accounting Office.

In fiscal year 1959 the Division reviewed and took action as necessary on a total of 47 audit reports issued by the General Accounting Office, and 136 internal audit reports rendered by Interior bureaus.

Division of Inspection

W. Darlington Denit, *Director*

The Division of Inspection is responsible for the inspection and investigative activities of the Department. The primary purpose of the Department's Inspection Program is to insure high ethical standards in the management of the Department's affairs. The Division of Inspection provides policy guidance and coordination for the program.

During the past fiscal year special attention has been devoted to the analysis and restatement of regulations of ethical import. The statement of ethical principles contained in the Code of Ethics for Government Service, passed by the Congress of the United States on July 11, 1958, was the subject of special review and revised Departmental rules of conduct developed in collaboration with other

staff divisions were issued. New regulations based on special studies concerning outside employment are being developed.

The investigative program embodies special investigations of alleged administrative irregularities in the discharge of official duties. During the past fiscal year, investigative work was maintained on a current basis.

The Division of Inspection also has responsibilities in Departmental handling of matters under the Government Employment Policy enunciated in Executive Order 10590 and related Department regulations. Policy administration and enforcement were successfully continued.

Division of Management Research

Arthur B. Jebens, *Director*

The Division of Management Research has the primary staff responsibility for the improvement of the general management and organization throughout the Department. This includes continuous review of Departmental operations to ensure the most efficient and effective use of manpower, funds and equipment.

During the past year this Division has participated in a number of management studies and provided management assistance in a variety of projects including:

(1) A study of the organization, procedures, and operations of the Office of Saline Water.

(2) A study of the organization and management of the Bureau of Reclamation consisting primarily of a review of Regions 6 and 7 in the Missouri River Basin and the Office of the Assistant Commissioner and Chief Engineer in Denver, Colo., with some workload and staffing data collected on a bureauwide basis.

(3) Coordinated the preparation of the Emergency Operations Handbook outlining the Department's policies and procedures for emergency planning and operations of the Department in the event of enemy attack.

(4) Prepared a policy statement and procedures for inclusion in the Departmental Manual relating to the administration of tort claims against the Government.

(5) Undertook a procedures study of the Circulation Unit of the Department Library.

The Division's Branch of Directives Management administered a system for the preparation, review, and issuance of Secretarial directives. More than 240 documents were processed for Secretarial action. Of these, 123 were Federal Register documents; 72 were Departmental Manual releases; and 25 were proposed Presidential documents.

Under the Incentive Awards Program there has been a 13 percent increase in suggestions and a 100 percent increase in Distinguished Service Awards. The following statistics reflect the 1959 activities in the Incentive Awards Program:

Suggestions submitted -----	5,226
Superior Performance -----	1,133
Special Acts Award -----	80
Distinguished Service Award -----	64
Meritorious Service Award -----	120
Commendable Service Award -----	368
Valor -----	7

Division of Personnel Management

Newell B. Terry, *Director*

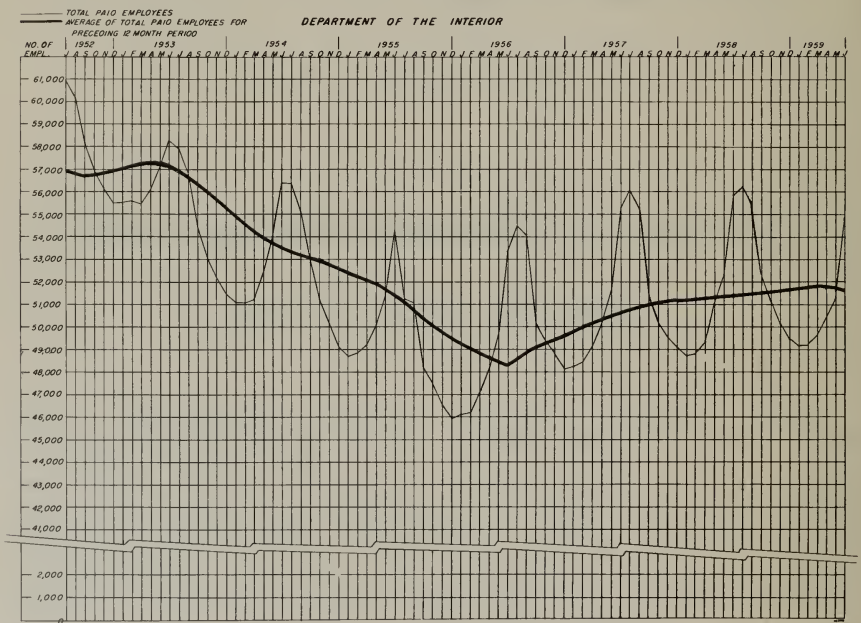
To give full effect to the new Government Employees Training Act a survey of training needs of each of the bureaus and offices was made, and the Departmental training policy was revised and strengthened. Standards were developed and responsibilities and controls for training were established. One hundred seventy-five requests of bureaus for approval of training in non-Government facilities were reviewed. Most were for short-term courses and programs in many varied fields.

After a study of more than 2 years, which included discussions and conferences with representatives of the Civil Service Commission and labor unions, Departmental Manual chapters were issued covering both labor relations policy and labor management negotiations. The first formal labor agreement in the Bureau of Indian Affairs and the 20th to be established in the Department was signed

with the International Brotherhood of Electrical Workers, Local No. 570, at Tucson, Ariz.

Four detailed safety conference guides with related visual aid charts were published for the use of bureaus and offices in furtherance of the safety program, and two safety instruction seminars were conducted, one for employees of the east coast area and one for employees of the Rocky Mountain area. The rate of disabling work injuries for each million man hours of employment is now at its lowest point in thirteen years.

A booklet entitled "Career Profiles" was prepared to provide college placement officers and students with interesting factual information on jobs in the Department. The booklet will serve the further purpose of publicizing within the Department the incentive awards and training programs. Also, a guide for appointing officers entitled "Judging Fitness for Federal Employment" was published.



Interview training has continued throughout the year and a new training course was conducted for personnel technicians covering nine aspects of employment procedures and problems.

All bureaus and offices of the Department developed and put into effect new promotion programs.

Division of Property Management

N. O. Wood, Jr., *Director*

Over 600 field personnel attended Property and Records Management conferences held in field locations. Operating instructions and procedures are being revised to reflect specific conference recommendations.

Forms Improvement Workshops were held in the Washington headquarters, with a total attendance of 218 middle-level officials. In addition, 125 Washington secretaries were given training on secretarial correspondence. Records disposal activities resulted in freeing over 51,000 cubic feet of filing space.

Personal property costing almost \$1 million was reassigned within the Department, minimizing the purchase of new equipment. Used equipment originally costing over \$11 million was obtained from other Federal agencies. Approximately \$1 million was realized from sales of obsolete equipment.

New developments in the purchasing and contracting field were incorporated in the Department's uniform regulations. Small Business participation in contracting increased from 64.7 to 65.4 percent during the first half of fiscal year 1959 and was extended to construction contracts and to sales of Government-owned timber.

Training of selected personnel in cryptographic communications was continued. A total of 234 radiofrequency assignments were made for the bureaus and offices. A Departmental CONELRAD (Control of Electromagnetic Radiation) spot-check program was established and an initial survey made. Relocation communication exercises were continued with increased staff participation.

Division of Security

J. Cordell Moore, *Director*

In the field of Physical Security, the training course for handling classified material was completed. Ten well-attended classes were held in Washington, D.C. These courses have brought a better

realization of the security responsibilities of Federal employees in sensitive positions.

Three conferences were held during the year designed to improve the procedures and preparations made by the Department to cope with disasters pursuant to the Division's responsibilities under Public Law 875, 81st Congress. The Department actively assisted other agencies in the mine disaster near Pittston, Pa., when the Susquehanna river broke into the Knox Mine during January 1959. Participating bureaus were the Bureau of Mines, the Geological Survey, and the Bureau of Reclamation.

In the field of Personnel Security, there was a continuing review of sensitive positions designed to keep all clearances up-to-date; to eliminate all unnecessary files; and to streamline procedures.

The Radiological Monitoring program of the Department has been materially advanced. Starting the year with about 100 employees trained in this field, the figure at the end of the year had risen to 631. Monitoring capability has now been established in three-fourths of the States including Alaska.

The Division of Security, by invitation of the Office of Civil and Defense Mobilization, now represents the Department on the Interdepartmental Committee on Radiological Defense. This is recognition of the capability which has been established by the Department in the field of radiation detection. The Department will also provide 450 stations to the Federal Radiological Monitoring network.

Office of the Solicitor

George W. Abbott, *Solicitor*



MANY LEGAL PROBLEMS were presented during fiscal year 1959 involving complex Federal-State questions arising out of the establishment of Alaska's government, courts, and the administration of its resources under the Statehood Act and the Alaska Constitution. Among others, opinions were prepared concerning the continuation of Federal regulatory laws in Alaska, the classification of terms of office of the first United States Senators, and the suffrage laws applicable to the initial Alaska elections. Problems also arose in connection with Statehood for Hawaii, particularly the necessity for reapportionment with respect to its first State Legislature.

The sharp increase in the appeals to the Secretary from the decisions of the Director of the Bureau of Land Management continued at an accelerated rate. A total of 426 appeals were received, which is an increase of 89 percent over fiscal year 1958. This appeals workload, together with a comparable increase in appeals to the Director, became so serious that a special committee was established to study and make recommendations to alleviate the situation. Action has not yet been taken on these recommendations.

The Board of Contract Appeals disposed of 27 cases and in eight other cases appeals were withdrawn, or otherwise disposed of, without any decision. In nine of the 27 cases, there are involved questions relating to requests for extensions of time of performance of the contracts in order to avoid liquidated damages.

Much work has been done in reducing the number of "backlog" Indian probate cases which were pending before Inheritance Examiners on June 30, 1955. The 2,454 such cases which were on hand at that time have been reduced to 79. At the same time, Inheritance Examiners had decided 5,222 cases of the 6,983 "new" cases filed since June 30, 1955.

Many opinions were rendered which facilitated the economic development of tribal and individually owned Indian lands, or have assured protection to the Indians in the use and development thereof. Noteworthy in these opinions is the one solving the difficult legal problem of equalization of allotments and the leasing or other disposition of the valuable Palm Spring, Calif., Indian-owned lands.

In each new Congress the number of requests by the congressional committees for reports on bills introduced increases. For a comparison, during the first session of the 84th Congress, 656 requests were received; during the first session of the 85th Congress, 853 requests were received; and during the first session of the 86th Congress, 952 requests were received.

The enactment of the Boulder City Act of 1958 (72 Stat. 1726) resulted in a considerable volume of work for the Los Angeles region. This act authorizes the Secretary of the Interior to sell the Federally-owned housing in Boulder City which is not needed in connection with the administration, operation and maintenance of Federal activities located within or near the Boulder City municipal area.

Progress has been made in placing patent application work on a more current basis. It is anticipated that most cases will hereafter be considered for patent action within 12 months of submission. Nine patents were granted to the Department during fiscal year 1959, based upon researches conducted for the public benefit. One of these patents covers the so-called hot carbonate process for gas purification developed by the Bureau of Mines, which is now in extensive industrial use.

Regulations were prepared and published for the administration of the exploration program by the Office of Minerals Exploration. Regulations to implement the provisions of the Boulder City Act of 1958 were drafted and published in the Federal Register. Regulations were also issued improving procedures, encouraging wiser use and development of natural resources, or implementing new legislation. One of these governs allotments to Indians, Aleuts, and Eskimos; another governs mining, development and utilization of mineral resources on public lands withdrawn or reserved for power development.

An important change in the contractual relationship between the Bonneville Power Administration and the four privately owned utility companies in the Pacific Northwest was effected. On September 1, 1958, certain provisions of the 20-year power sales contracts became effective for the first time and the regular Bonneville Power Administration rate schedules were applied to the private

companies in lieu of the special rates that had therefore been available to them.

The Denver Region has initiated the Davis and Featherstone oil and gas lease contests to effect the administrative cancellation of oil and gas leases obtained from the Government through alleged violation of acreage limitations. There follows a list of important cases decided by or pending in the courts and some administrative decisions. Cases of interest to the Bureau of Reclamation will be found in the "Litigation" part of the report of the Commissioner of Reclamation.

St. Marys Sewer Pipe Company v. Director of the U.S. Bureau of Mines (262 F. 2d 378). The court sustained an order issued by a Federal coal mine inspector under the Federal Coal Mine Safety Act, classifying a coal mine as "gassy" where methane seeped into it from an abandoned gas well penetrating the coal seam.

Alonzo A. Adams v. Paul B. Witmer et al. (No. 15859 U.S. Ct. of Appls., 9th Cir.). A mining claimant, whose claims had been declared null and void on appeal to the Secretary, could maintain an action against the manager of the Los Angeles land office to enjoin him from canceling the claims on the land office records, and the Secretary was not an indispensable party to the action. A petition for rehearing has been filed.

Ketchikan Packing Company et al. v. Fred A. Seaton, etc., et al. (267 F. 2d 660). The Secretary acted within his authority in banning fish traps in Alaska.

Wade McNeil v. Seaton (No. 648-58, U.S.D.C., D.C.). A special rule adopted under the Federal Range Code was not invalid because it was not adopted in conformity with the rule-making requirements of the Administrative Procedure Act. This was based on the ground that the rule involved public lands, so came within the exception of "public property" exempted by the act from the rule-making provisions. The Department has taken this position since the enactment of the Administrative Procedure Act.

United States v. Edgar Camp (Civil No. 1551, U.S.D.C., E.D. of Washington). The Secretary has authority to regulate grazing and to require tribal members to obtain permits and pay fees for grazing on allotted lands on the reservations of tribes which did not reorganize under the Indian Reorganization Act of 1934.

State of Washington, ex rel., Zempel v. Denney (153 Washington Advance Sheets, No. 26). The effect of this case is to vest full criminal and civil jurisdiction, on many Indian reservations in Washington, in the State courts. The case has been appealed to the United States Supreme Court.

Larsen-Meyer Construction Company (Bd. of Contr. App., 65 I.D. 463). The unusualness of the weather on a stormy day cannot be determined merely by measuring the severity of the weather on that particular day against the average weather for the same day in prior years, but must be determined on a basis that takes account of the frequency with which days of like or greater severity occurred during the same months or seasons of prior years.

Lord Brothers Contractors (Bd. of Contr. App., 66 I.D. 34). A "changed conditions" claim of a tunneling contractor which had encountered a continuous stretch of tuff or tuff breccia of approximately 3,000 feet in variable volcanic material in excavating a tunnel approximately 3,600 feet long was rejected in view of the geological evidence.

Inter-City Sand and Gravel Company and John Kovtynovich (Bd. of Contr. App., 66 I.D. 179). Contractors encountered hard material in constructing a dam. A "changed conditions" claim was rejected on the grounds that such hard material was indicated, and that the contractors had not conducted an adequate site investigation. The decision announced the doctrines that whether or not logs of exploration could be regarded as unqualified representations must depend on the circumstances of each individual case, and that the duty of conducting an adequate site investigation was enjoined in both first category cases, involving misrepresented conditions, and in the second category cases, involving unanticipated conditions, although the standards of adequacy might be less rigorous in first than in second category cases.

Bushman Construction Company (Bd. of Contr. App., 66 I.D. 156). When the last day on which an appeal may be taken from findings of fact under the "disputes" clause of Government contracts falls on a day that is a State, but not a Federal, holiday, the time for taking the appeal is not extended to the next business day.

M-36549 (February 3, 1959). Indians of the Palm Springs Reservation executed separate agreements with their lessees who held approved leases on restricted Indian lands. The obvious purpose of such agreements was to extend the lessees' tenure beyond the term of the approved leases, or to require the Indians to purchase improvements on the lands. Such agreements were invalid, insofar as they attempted to bind restricted Indian property, without the required approval of an officer of the Department.

Technical Review Staff

John B. Bennett, *Director*



DURING FISCAL YEAR 1959, the Technical Review Staff continued its work of coordinating the interests and responsibilities of the Department of the Interior in the minerals, fuels and fisheries fields, as affected by and as they might affect the work of United States' participation in the General Agreement on Tariffs and Trade (GATT). The TRS supplied a departmental representative on the United States delegations to the meetings of the Contracting Parties of GATT and several of its committees and working parties at meetings held in Geneva, Switzerland.

Similarly, foreign trade problems taken up in other international forums were coordinated through the TRS. Arrangements were made for experts on United States delegations to many other international conferences in the natural resources field.

An agreement was negotiated with the Department of State to improve foreign service reporting on worldwide minerals, fuels and fisheries developments, including the establishment of a minerals and fisheries attache program within the Foreign Service administered by the Department of State.

The TRS arranged for official visits to the Department of foreign dignitaries and officials, scientists, and students interested in exchanging information.

With completion of the International Geophysical Year there has been a reorientation of the United States program in Antarctica, which has involved the Department to a greater extent than heretofore. The TRS has continued to coordinate Antarctic matters within the Department and to provide representation on the Operations Coordinating Board Working Group for Antarctica, which recommends operating policy and programs.

Defense Mobilization

The TRS continued to represent the Department as principals or alternates on various interagency groups developing defense mobilization plans. It provided staff support to the Assistant to the Secretary (Defense Activities) in coordinating certain aspects of the Department's defense functions and programs. Included in the groups are the Mobilization Plans Group and Interagency Planning Group of the Office of Civil and Defense Mobilization, the Industry Evaluation Board, the Interagency Committee on Essential Survival Items and the Interagency Advisory Committee on Essential Activities and Critical Occupations. During fiscal year 1959 substantial time was spent on assisting in the preparation and review of Annexes to The National Plan for Civil Defense and Defense Mobilization, published by OCDM in October 1958.

The Technical Inter-Agency Power Group, composed of representatives from Office of Civil and Defense Mobilization, Departments of Defense and Commerce, and the Federal Power Commission, and chaired by a member of TRS, conducts studies to evaluate the adequacy of electric power under mobilization conditions. On June 29, 1959, the group submitted its "Report of Reconnaissance Power Survey of the Greater Anchorage-Fairbanks Area of Alaska" to the Director, Office of Civil and Defense Mobilization.

The TRS represents the Department on the National Rural Fire Defense Committee. During the year a national plan for rural fire protection was developed by the Committee and placed before the Office of Civil and Defense Mobilization. This plan provides for the inclusion of some 546 million acres of forest, brush, marsh, tundra and grass lands administered by this Department within the national plan for fire control action.

Soil, Moisture, and Weed Control

The TRS has continued to provide technical assistance and act in a coordinating capacity for the soil and moisture, weed control, and watershed protection programs of the Department. In the area of soil and moisture conservation, increased emphasis has been placed upon closer coordination with bureau field activities as related to both programing and development. A general program reappraisal was conducted of requirements based on changing conditions, more detailed inventory surveys, and general program requirements. Administrative and procedural changes designed to facilitate program execution were recommended.

Through its chairmanship of the Departmental Weed Control Committee, the TRS serves as a medium for an exchange of the most current weed control techniques and procedures.

Interdepartmental and intradepartmental coordination activities relative to the Watershed Protection and Flood Prevention projects (Public Law 566) increased during the year, due primarily to accelerated local participation, program planning, and an increase in the number of approved projects.

Forestry

The TRS assisted in coordinating the activities to carry out responsibility under the act of August 13, 1954, as amended, the Klamath Termination Act. During the year three major phases were completed: (1) a review of the appraisal as required by law; (2) transfer to the U.S. National Bank of Portland, Oreg., as trustee, of those properties assigned to the Klamath Indians voting to remain as a unit; and (3) sale of most of the real property outside the designated boundaries of the Klamath forest.

The TRS coordinated the preparation of a 113-page report to the Chairman, Committee on Government Operations, with respect to the recommendations contained within House Report No. 2960 on Federal timber sales policies. One of the recommendations would have provided for the consolidation of the commercial forests of the Department of the Interior with those of the Department of Agriculture. This Department was not in agreement with the recommendation. With respect to most of the other recommendations the Department has either taken affirmative action or is now in the process of carrying out such recommendations.

The TRS continued to coordinate the Department's forest and range fire, forest insect and tree disease control programs. During calendar year 1958 fire losses were considerably less than in 1957, although a greater number of fires occurred. In 1958 there were 3,450 fires compared to 2,471 in the previous year. However, the area burned over totaled only 856,242 acres as compared with 5,220,078 acres in the previous year. At the end of fiscal year 1959, however, lightning fires were reported heavy in Alaska and it is possible that the area burned over may be rather high for the 1959 fire season.

Prevention of serious losses from diseases and insects in the 183 million acres of forests and woodlands administered by the Department is the prime objective of the forest pest control program. During the calendar year 1958 approximately 1,400,000 ribs were

destroyed on 27,000 acres in the protection of the white pines from the ravages of blister rust (an introduced disease). During the year the Department was confronted by the following major forest pests in epidemic proportions: Mountain pine beetle at Grand Teton, Lassen Volcanic, and Yosemite National Parks; lodgepole needleminer in Yosemite National Park; dwarf mistletoe in the Mescalero Reservation; and spruce budworm on public domain in Montana, intermingled with private and national forest lands.

The Department is represented by a member of the TRS on the Organizing and Executive Committees for the Fifth World Forestry Congress, which will be held at the University of Washington, Seattle, Wash., August 29–September 10, 1960.

Conservation Bulletin No. 41, "Highlights in the History of Forest and Related Natural Resources Conservation" was compiled by TRS during the year. This bulletin sets forth in chronological sequence the major actions affecting the Department in the field of forest and related natural resources conservation from 1783 through 1958.

Staff Service

The TRS continued to carry staff responsibility for the technical aspects of the Department's program for the improvement of real property appraisal procedures through consultation with the bureaus on such matters as appraisal staffing, procedures, and training, and through attendance at bureau appraisal training conferences.

The TRS provides staff service to the Secretary in connection with his duties as Chairman of the President's Council on Youth Fitness; to the Under Secretary in his capacity as liaison with the Outdoor Recreation Resources Review Commission; to the Assistant Secretary for Water and Power in the work of the Inter-Agency Committee on Water Resources; and to the Secretariat on special problems.

A major step in connection with the Department's field committee activities was the reactivation of the Alaska Field Committee, which had been dormant for a number of years. This brings the total number of field committees in operation to six.

Continuing operations of the TRS include the provision of liaison with the Bureau of the Budget on coordination of statistical standards and programming of surveying and mapping; with the National Science Foundation; with the Atomic Energy Commission on its "Operation Plowshare" program; and with other Federal agencies on program matters of mutual concern.

Oil Import Administration

Captain Matthew V. Carson, Jr. (USN), *Administrator*



THE SECRETARY OF THE INTERIOR, pursuant to Presidential Proclamation 3279, dated March 10, 1959, established the Oil Import Administration within the Department, issued regulations for the operation of an oil import program, and delegated the authority conferred upon him by the President to the Administrator.

The objective of the oil import program is to insure a stable, healthy petroleum industry within the United States capable of exploring for and developing new domestic petroleum reserves. The basis of the program—like that of its predecessor voluntary program—is the certified requirements of national security.

In administering the program, the staff of the Oil Import Administration:

1. Analyzes data prepared by the Department's Bureau of Mines relating to petroleum demand in the United States, by commodity type and petroleum districts, in order to set the overall amounts of crude and unfinished oil, residual fuel oil, and finished petroleum products to be allowed into the United States and Puerto Rico.
2. Analyzes applications from prospective petroleum importers to determine their eligibility under Oil Import Regulation 1, as revised, for semi-annual oil import allowances of crude oil and its principal derivatives.
3. Establishes equitable semi-annual oil import allocations for individual eligible oil importers by product type and district and issues import licenses.
4. Analyzes monthly reports from each importer showing the amount and disposition of petroleum imports entering the Nation under license and issues public reports concerning the oil import situation and the administration of the program.

5. Responds to an increasing volume of requests for information concerning the administration of the program from Congress, the press, and the public.

Summary of Activities

The Oil Import Administration issued regulations concerning its activities, upon approval of the Secretary of the Interior, on March 13, 1959, and set the maximum allowable import levels for the allocation period ending June 30, 1959.

On March 17, 1959, the Oil Import Administration issued individual allocations to 136 eligible crude and unfinished oil importers in the United States and Puerto Rico for the March 11-June 30 period.

The Administration inaugurated on April 1 import controls on residual fuel oil and finished petroleum products in accordance with the Presidential Proclamation establishing the program and issued import allocations to 46 eligible importers of these commodities.

During the period, the Oil Import Administration issued 327 licenses for importation of crude petroleum and its derivatives to eligible importers according to commodity type and requested ports of entry. In the initial allocation period the Administrator transferred 81 appeals to the Department's Oil Import Appeals Board.

Prior to the close of the fiscal year, the Administrator announced overall oil import levels for the allocation period July 1, 1959, through December 31, 1959, and issued individual oil import allocations to 225 eligible importers.

Oil Import Appeals Board

Royce A. Hardy, *Chairman*



THE OIL IMPORT APPEALS BOARD was established on March 13, 1959, to hear petitions and appeals by persons affected by the Mandatory Oil Import Program established by the President on March 10, 1959.

On the grounds of hardship, error, or other relevant special consideration, the Board is authorized, within specified limits, to modify any oil import allocation granted by the Oil Import Administration; to grant an allocation of crude and unfinished oils, in special circumstances, to persons with importing histories who do not qualify for allocations; and to review the revocation or suspension of any allocation or license.

During fiscal 1959 the Board rendered 34 decisions on 38 appeals within the jurisdiction of the Board, and dismissed 29 other petitions because the Board has no authority to consider them. Thirteen appeals were withdrawn, and one was transferred to the July 1–December 31, 1959 allocation period.

Of the 38 decisions of the Board, 26 followed public hearings. In 12 appeals decided by the Board, public hearings were not requested by the appellants and none was required by the Board. In six appeals, the Board granted relief based upon grounds of special circumstances, importing history, and error.

In denying relief in the remaining 32 appeals, the Board found in most instances that the appellants had not established sufficient hardship to warrant relief. In the other instances the Board decided it had not authority to correct the alleged errors under or to permit carryovers from the Voluntary Oil Import Program under which it had no functions; to modify allocations of finished and unfinished products; to grant credits for bartered oil; or to grant relief based upon contracts antedating the Mandatory Oil Import Program.

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